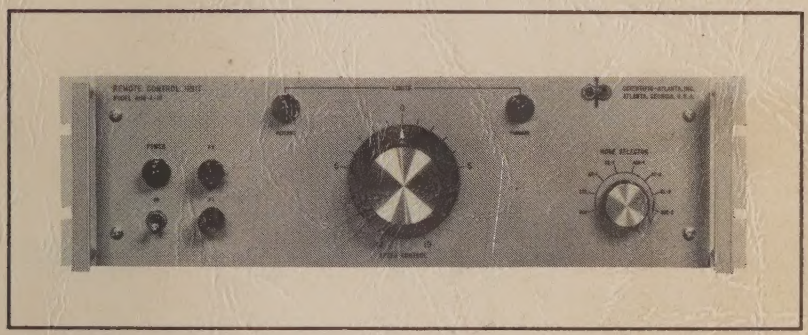
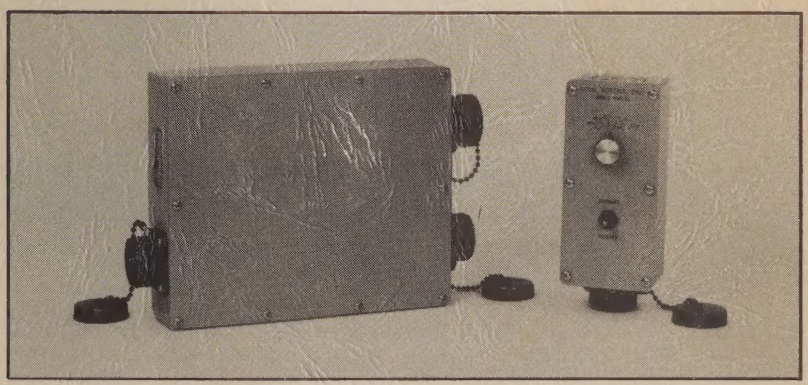
ME-7798

Instruction Manual

Model 4116A
Remote Control Unit





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When ordering parts from Scientific-Atlanta, Inc., be sure to include the equipment model number, equipment serial number, and a description of the part.

MODEL NO. _____

SERIAL NO. _____

MODEL 4116A
REMOTE CONTROL UNIT

Revisions in this instruction manual apply to equipment serial number 600 and above.

In all correspondence concerning this publication, refer to **50E027D**

SECONT EDITION, REVISED
DECEMBER, 1979

SCIENTIFIC-ATLANTA, INC.

163274

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RECORD OF INSTRUCTION MANUAL CHANGES

This Instruction Manual Publication No. is 50E027D and supercedes Publication No. 50E027C. If the title page identifies this instruction manual as new (i.e., FIRST EDITION) or as having been generally and/or completely revised (i.e., SECOND EDITION, THIRD EDITION, etc.), the manual contents accurately specifies the equipment as of the publication date. When the title page identifies a suffix change in the Publication Number with FIRST EDITION, REVISED, for example, the manual has been updated to incorporate the latest equipment changes and corrections to text. All pages having been revised, updated, or corrected are identified by the latest publication number and are also listed below.

Page	Item	Reason
i	Publication No.	Revision Change
vii	Table of Contents	Revision Change
4-2	Figure 4-1	Revised
4-3	Para. 4.2.2.1	Revised
4-6	Para. 4.2.5	Revised
4-7	Para. 4.2.6	Revised
5-4	Para. 5.6.1	Revised
5-6	Table 5-1	Revised
6-3	Parts List	Updated
6-7	Parts List	Added for PCB A2
6-8	Parts List	Revised for 4116-10
6-9	Parts List	Revised for 4116-20
7-1	Chapter 7	Revised complete chapter

CHAPTER 1
GENERAL INFORMATION

1.1 GENERAL

1.1.1 The Scientific-Atlanta Model 4116A-10 Remote Control Unit (Figure 1-1) offers centralized control of two three-axis positioners. Provisions are made for positioner and axis selection, control of the drive-motor speed and direction, limit indication, and local control when used with the Model 4116-20 Local Control Unit (Figure 1-2). Automatic dynamic braking of the drive motors prevents excessive overtravel when the positioner reaches a limit or the control is returned to zero from either direction. Solid-state components and enclosed relays are used to provide maximum reliability and to minimize down time and maintenance.

1.1.2 The Model 4116A-10 can be used directly in conjunction with Scientific-Atlanta Model 2011 Positioner Programmer to provide a complete automatic antenna positioning and scanning system.

1.2 SPECIFICATIONS

Characteristic	Specification
Load Characteristics	
Motor Type	DC shunt
Motor Rating	3/4 hp (max)
Armature Supply	0-120 volts dc, 6.5 amperes maximum, continuous (8.5 amperes for 50% duty cycle, "on" period less than 10 minutes)
Field Supply	105 volts dc, 4 amperes, max.
Input Voltage	105-125V ac, 50/60 cps, 1ϕ
Input Power	
Full Load	1300 watts
Standby	350 watts (max)
Dimensions	Standard 19-inch wide panel, 5-1/4 inches high and 16-1/8 inches deep
Weight	25 pounds net (11 Kgs)

Figure 1-1. Typical Model 4116A-10 Remote Control Unit

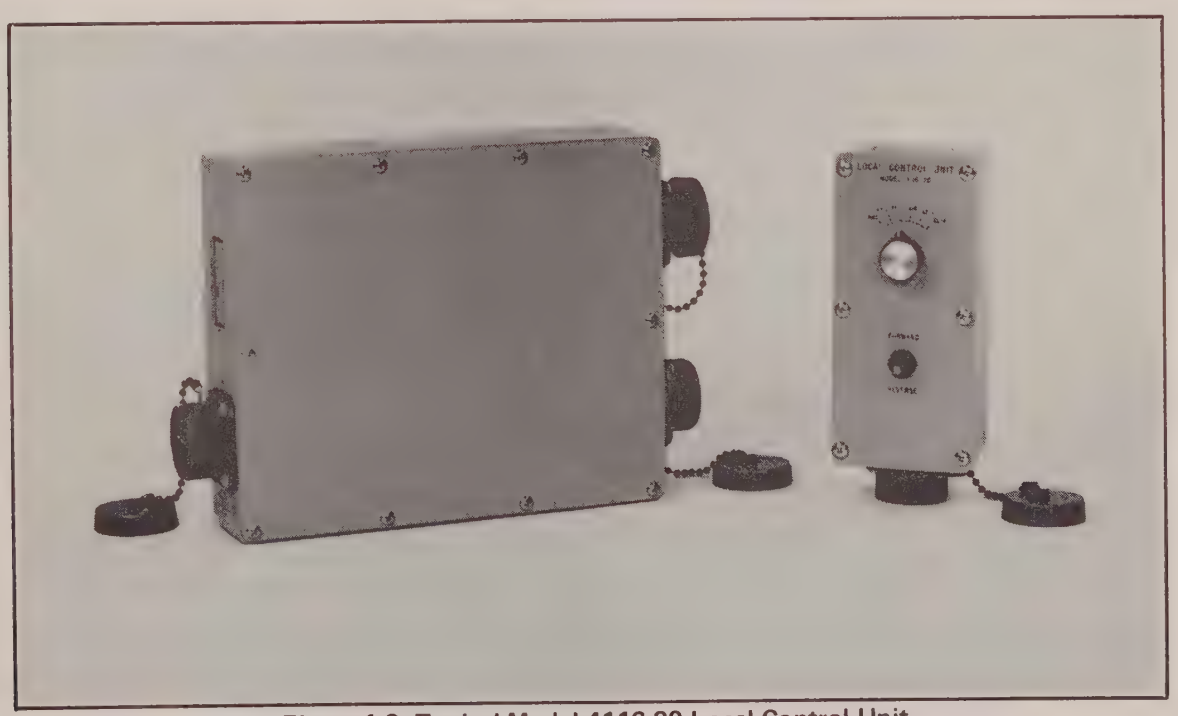


Figure 1-2. Typical Model 4116-20 Local Control Unit and Junction Box (Optional).

CHAPTER 2
INSTALLATION

2.1 GENERAL

2.1.1 This section contains general information necessary to install and turn on the Model 4116A-10 Remote Control Unit.

2.2 UNPACKING AND INSPECTION

2.2.1 Carefully unpack the shipping carton, inspecting all items for shipping damage. If damage is evident, contact the carrier and the nearest Scientific-Atlanta sales representative immediately. Save the packing materials and shipping papers for inspection by the carrier's representative. Do not return the instrument to the factory without receiving specific return shipment instructions.

2.2.2 The shipping carton may be used for storage or further transport of the unit. Save all packing material until satisfactory operation of the instrument is obtained.

2.3 INSTALLATION

2.3.1 Instrument Location. The unit may be supplied in a rack or console, or it may be installed in a rack or console by the user. The manufacturer suggests avoiding heat sources when locating the unit, and recommends that ventilation of the instrument not be obstructed.

2.3.2 Installation Procedure.

a. Place the front-panel POWER switch in the off position.
b. Determine the routing and length of the cables required. In some cases, the interconnecting cables may be supplied, or the instrument may be supplied as a part of a pre-connected system.

2.3.3 Installation Details. The remote control unit may be installed in any position. All connections except the power input are made through Type MS connectors located on the rear of the chassis. Refer to Chapter 7, Figure 7-1, for pin connections. Figure 2-1 shows cable connections made with various configurations of accessory equipment for the Model 4116A-10 Positioner Control. Note that switch S5 or S6 must be in the REMOTE ONLY position if a local control (Model 4116-20) is not being used in the system. One positioner with up to five axes or two 3 axis positioners can be operated locally with the standard Model 4116A-10 Remote Control Unit and a Model 4116-20 Local Control Unit. Refer to Figure 2-1 for cable connections.

2.3.4 Limit Switches. The Model 4116A-10 is designed to operate positioners which have limit switches. Jumpers should be used in place of the limit switch if the positioner does not require limits. When the Model 4116A-10 is used with the Model 4116-20, the limit control lines are used to select and control the proper axes. Where only remote operation is required, and where range length or the availability of limit lines makes the use of limit lines impractical, the limit lines for a particular axis may be jumpered out in the control cable at either J4 or J5 which ever is being used to allow that axis to operate without limit lines.

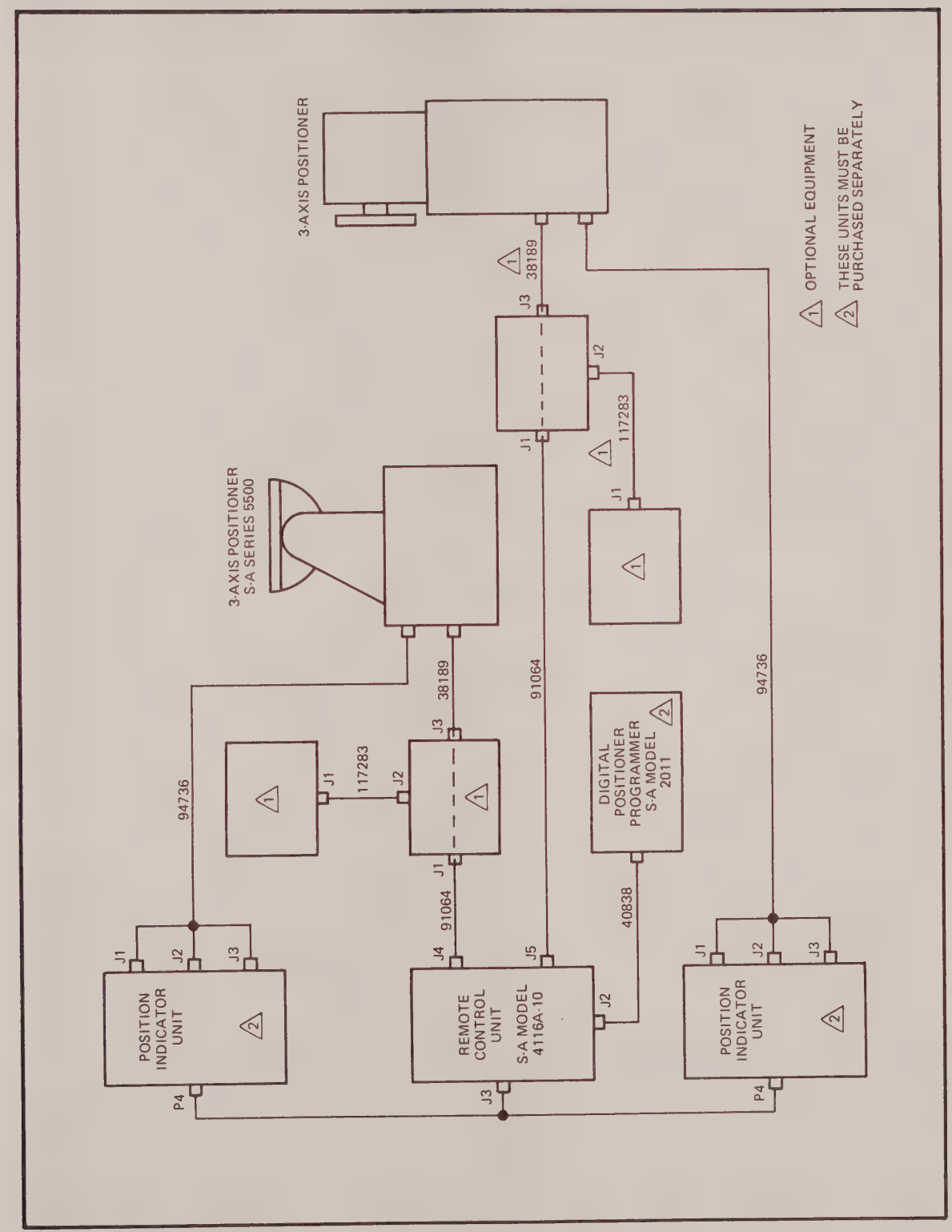


Figure 2-1. Model 4116A-10 Remote Control Unit, Cabling Diagram

CAUTION

WHEN THE LIMIT LINES ARE BYPASSED, NO PROTECTION IS AVAILABLE FOR THE AXIS OR AXES BYPASSED IN THE CABLE. IF THE CONTROL IS MOVED TO A POSITIONER THAT HAS LIMITS, NO PROTECTION IS AVAILABLE IF THIS CABLE IS USED.

2.3.5 Armature Fuses. To provide drive-motor protection, the proper size fuses should always be used. The motor fuses are located in the front of the axis-select relay, inside the unit. The correct fuse sized for the various horsepower motors are listed in Table 2-1. The armature fuses are labeled F3 through F8 and correspond to the positions marked on the selector switch. For example: F3--AZ 1, F4--EL 1, etc.

Table 2-1. Armature Fuses

Motor Size	Control Unit Fuse
1/12 horsepower	1.5A, 3AG, slow blow
1/8 horsepower	2A, 3AG, slow blow
1/3 horsepower	4A, 3AG, slow blow
3/4 horsepower	8A, 3AB, medium lag

2.3.6 Line Fuse. Fuse F1 should be chosen for the largest motor to be driven. Install a fuse in fuseholder F1 per Table 2-2 below. Fuse F2 is the field and control fuse and is a 4A, 3AG, slow blow buse.

Table 2-2. Line Fuses (F1)

Motor Size	Fuse
1/12 horsepower	3A, 3AG, slow blow
1/8 horsepower	3A, 3AG, slow blow
1/3 horsepower	5A, 3AG, slow blow
3/4 horsepower	10A, 3AB, medium lag

2.3.7 Supplementary Installation Information. When it is desired to control a dc motor other than one supplied with Scientific-Atlanta equipment, the following information may prove useful in determining the proper connections to be made to the positioner control unit.

2.3.7.1 The most common types of dc motors which can be operated from the Model 4116A-10 are shunt, compound, and series. Diagrams of typical configurations for each type are shown in Figure 2-2.

2.3.7.2 The armature terminations, designated as A1 and A2, should be connected to the armature supply of the control unit. The shunt-field terminals, designated F1 and F2, should be connected to the field supply of the control unit. Reversal of direction is accomplished by changing the polarity of the voltage applied to the armature winding while maintaining the field-voltage polarity constant.

2.3.7.3 The series-field winding in a compound motor is not used and should be isolated but not short-circuited. In some motors this winding is brought out to two terminals (S1 and S2) or may have one of its terminals common with the shunt field (L2 or S2-F2).

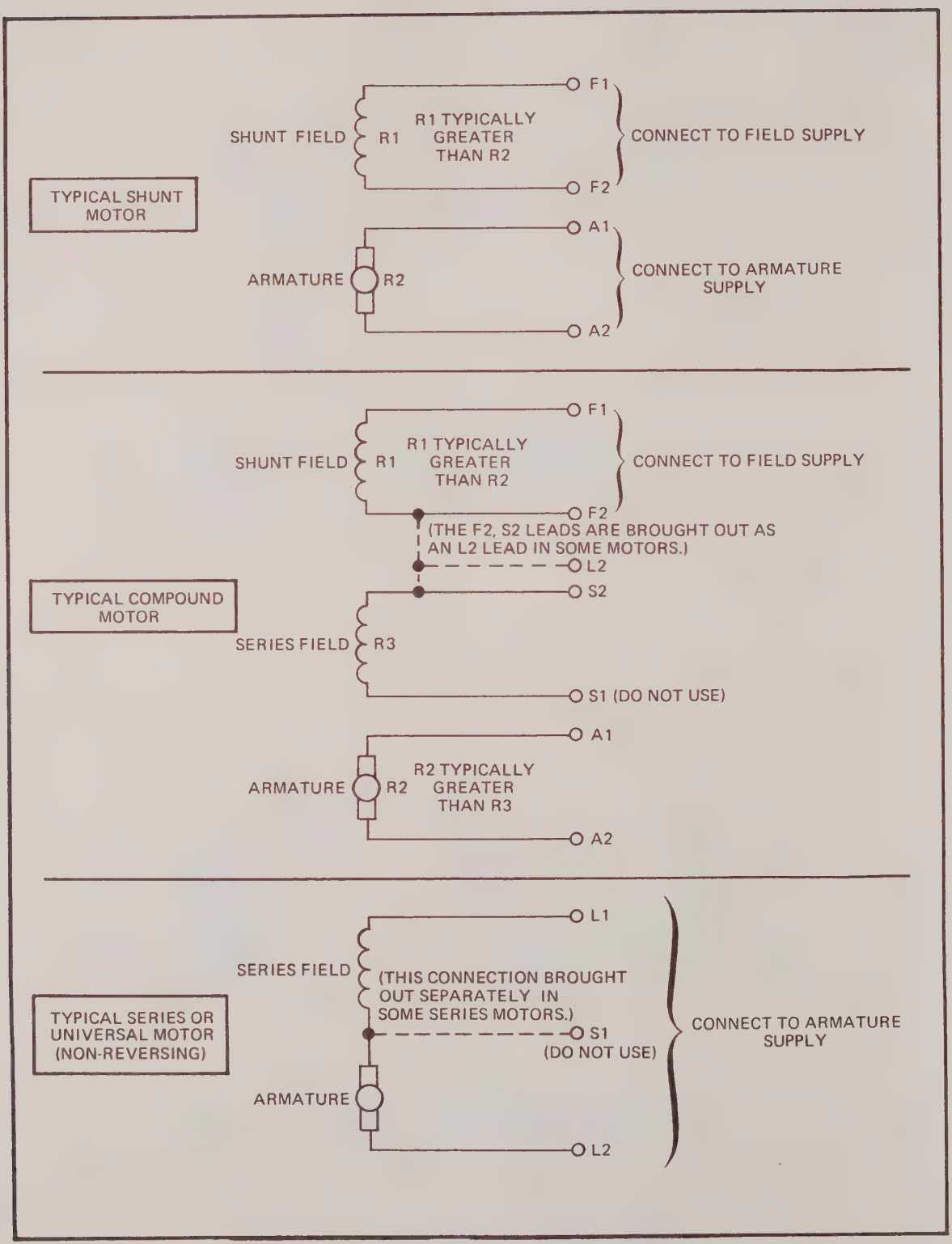


Figure 2-2. Typical Diagrams of DC Motors that can be controlled by a Model 4116A-10 Remote Control Unit

2.3.7.4 For each type of motor, the armature- and field-circuit currents should be measured. Do not allow the currents to exceed those for which the motor and the positioner control unit are rated.

2.3.7.5 The information contained in these paragraphs is of a general nature. Therefore, it is recommended that each individual motor be thoroughly investigated and all motor terminals positively identified, before actually connecting the motor to the positioner control unit. Relative resistance values of various motor windings are given on Figure 2-2.

CHAPTER 3
OPERATION

3.1 GENERAL

3.1.1 This section contains information necessary to properly operate the Scientific-Atlanta Model 4116A-10 Remote Control Unit and the Model 4116-20 Local Control Unit. Discussions of the front panel controls and indicators and operating procedures are given.

3.2 CONTROLS AND INDICATORS

3.2.1 Table 3-1 lists the front panel controls and indicators. Their reference designations and a brief description of the control or indicator are also listed.

Table 3-1. Front Panel Controls and Indicators

Controls	Description
POWER ON/OFF	The POWER switch is used to apply or remove ac power to the unit. The POWER lamp should glow to indicate that ac power is applied to the unit.

Table 3-1. Front Panel Controls and indicators (cont.)

Controls	Description
SPEED CONTROL	This control determines the speed and direction in which the positioner is driven. When it is in the OFF position, the drive motor is stopped. When operation is from the local control unit or the positioner programmer, the SPEED CONTROL must be placed in either the FORWARD or REVERSE range. It is recommended that this control be placed at a setting less than "7" during local or programmed operation.
MODE SELECTOR	This switch determines which axis of the positioner will be controlled by the positioner control unit. It also determines if the positioner will be controlled by the local control (LCL position) or from a programmer (PCP position).

3.3 OPERATION

NOTE

Before applying power to the Model 4116A-10, place the front panel controls in the following positions:

POWER	OFF (Down)
SPEED CONTROL	OFF (0)

The MODE SELECTOR switch should be placed in any position except LCL or PCP. Make sure that the positioner control cables are attached to the proper connector: i.e., positioner No. 1 to J-4 and positioner No. 2 to J-5.

3.3.1 Checkout, Remote Control. Connect the power cord to an ac source capable of supplying 15 amperes. Be sure to connect the ground conductor of the power cord to the system ground of the ac source.

3.3.2 Checkout Procedures. If travel past a limit will cause damage to the positioner or antenna, manually check the limit switches before the limits are reached during the following procedures:

A. Energize the unit. The POWER lamp should glow to indicate that power is applied to the unit.

B. Move the SPEED CONTROL to FORWARD-5. The drive motor chosen by the selector switch should drive the positioner clockwise. For example, if the selector axis is "elevation", the elevation angle should increase.

C. Allow the drive motor to run until a limit is reached. At this point, the FORWARD LIMIT INDICATOR should be illuminated.

D. Move the SPEED CONTROL to REVERSE-5. The FORWARD LIMIT INDICATOR should extinguish, and the drive motor should run until the reverse (counterclockwise) limit is reached. At this point, the REVERSE LIMIT INDICATOR should light.

E. Move the selector switch to another axis, or to the other positioner (if used), and repeat the steps above.

F. If a selected axis is not equipped with limit switches and if jumpers have been connected per paragraph 2.3.4, the selected drive motor should run continuously in the direction and at the speed determined by the setting of the SPEED CONTROL.

G. If difficulty is encountered in the checkout procedure, refer to Chapter 4 of this manual.

3.3.3 Checkout, Local Control. When a Model 4116-20 Local Control Unit is used with the remote control unit, S5 or S6 Local/Remote Switch on the rear panel of the Remote Control Unit (4116A-10) must be placed in the RMT/LCL position. Set the mode selector switch to LCL. Place the SPEED CONTROL at approximately the mid-point of either the FORWARD or REVERSE range.

3.3.3.1 At the local control unit, rotate the selector switch to the desired axis. Hold the direction switch in the FORWARD position. The positioner drive motor chosen by the setting of the selector switch should drive the positioner clockwise at a speed determined by the SPEED CONTROL on the Model 4116A-10. If elevation is the selected axis, the elevation angle should increase. Releasing the direction switch should cause the drive motor to brake to a stop. Hold the direction switch in the

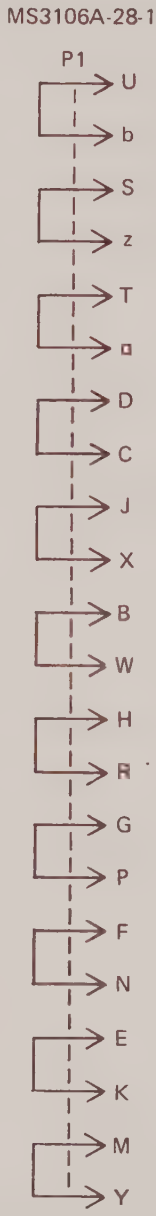
FORWARD position until the positioner reaches a limit. At this point, the drive motor should brake to a stop. Repeat this procedure in the REVERSE direction and in all other positions of the selector switch.

3.3.3.2 During local operation, the LIMIT OPERATION lamps on the Model 4116A-10 are turned on when the local selector switch is set to a specific axis and the direction switch is energized. The limit light in the direction selected will be turned off until a limit is reached.

3.3.3.3 If a Scientific-Atlanta Positioner Programmer is used with the Model 4116-10, set the MODE SELECTOR switch to PCP, and the SPEED CONTROL to FORWARD or REVERSE. Refer to the programmer instruction manual for further details.

3.3.3.4 When the system is wired for a local control unit, the jumper connector (Figure 3-1) should be inserted when the local control unit is removed. This permits the remote control unit to operate the system.

3.3.3.5 If difficulty is encountered in the checkout procedure, refer to Chapter 4 of this manual.



ALL WIRE NO. 20 AWG

Note:
The Model 4116A–10 Remote Unit can be used without the Model 4116-20 Hand Held Unit when this jumpered connector is used. This connector must be removed to provide operation with the Model 4116-20 Hand Held Unit.

Figure 3-1. Model 4116A-10 Remote Control Unit, Jumper Connectioner Diagram

CHAPTER 4
THEORY OF OPERATION

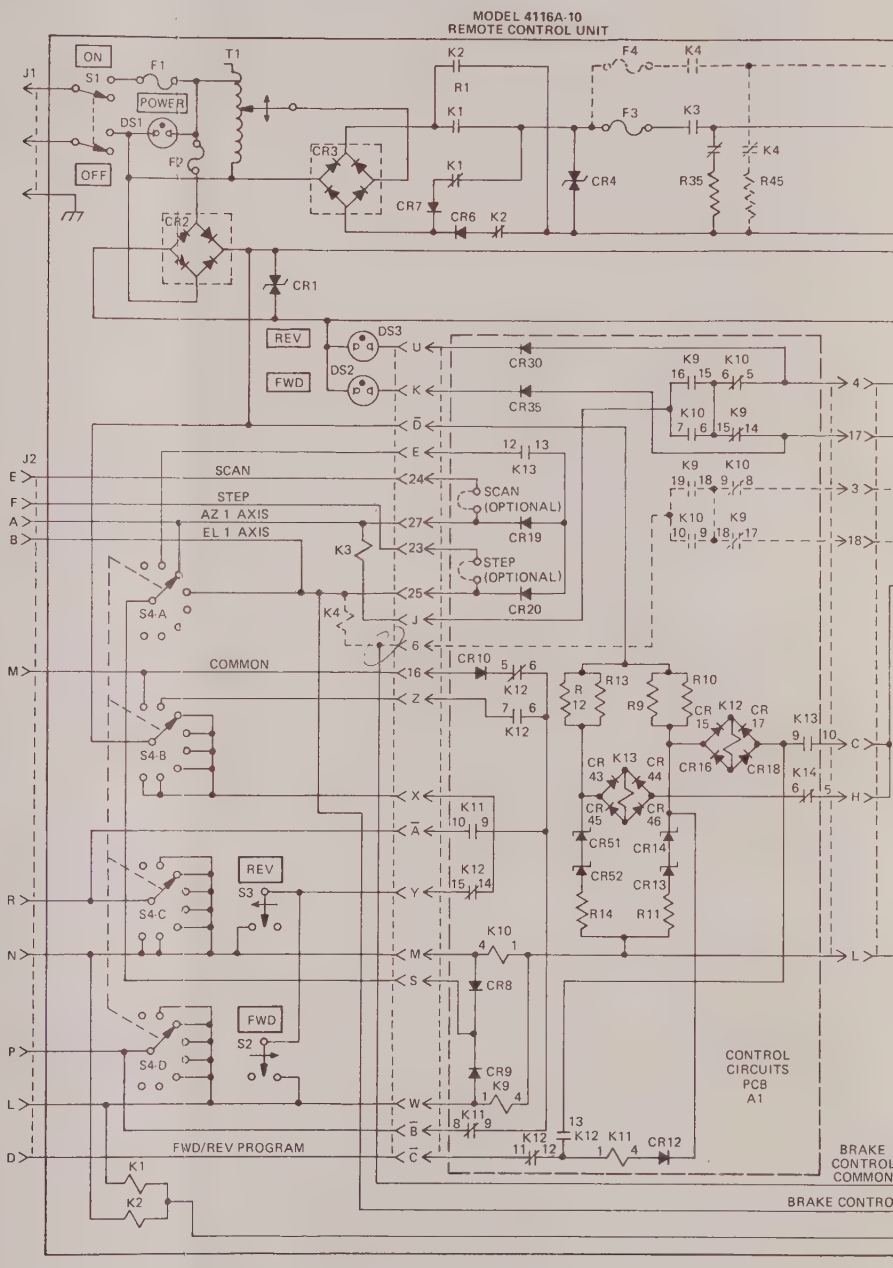
4.1 GENERAL

4.1.1 In the description of the control unit that follows, a simplified diagram is used to explain the unit's operation. This diagram shows the local control unit and junction box connected to the positioner control unit. If the unit is not equipped with a local control unit, the local control circuits and junction box shown can be disregarded.

4.1.2 For clarity, certain components have been omitted from the diagram in this chapter. Switch positions in this diagram are shown for the "AZ 1" axis or positioner No. 1, which is connected to J4 of the positioner control unit. Operation of other positioner axes is similar. Schematic diagrams of the positioner control unit, local control unit, and junction box are included at the rear of this manual.

4.2 DETAILED DESCRIPTION

4.2.1 Armature and Direction Circuits, Remote Mode. Line voltage is applied to variable autotransformer T1 through connector J1, switch S1, and fuse F1. The output of the autotransformer (see Figure 4-1) is connected directly to a full-wave silicon-diode bridge CR3. Surge protector CR4 prevents damage to the diodes in the armature supply from switching transients; CR5 suppresses arcing on the contacts of relays K1 and K2. Forward relay K1 or reverse relay K2 is energized by the closure of S2 or S3 when the variable transformer is rotated.


MODEL 4116A-10
REMOTE CONTROL UNIT
ON
OFF
POWER
S1
F1
T1
DS1
F2
J1
CR1
CR2
CR3
CR4
CR6
CR7
R1
R35
R45
K1
K2
K3
K4
F3
F4
REV
FWD
DS2
DS3
CR30
CR35
SCAN
STEP
AZ 1 AXIS
EL 1 AXIS
J2
SCAN (OPTIONAL)
STEP (OPTIONAL)
CR19
CR20
K13
S4-A
S4-B
S4-C
S4-D
COMMON
CR10
K12
R12
R13
R9
R10
CR12
CR15
CR16
CR17
CR18
CR43
CR44
CR45
CR46
CR51
CR52
CR13
CR14
R14
R11
K14
K11
S3
S2
CR8
CR9
FWD/REV PROGRAM
CONTROL CIRCUITS PCB A1
BRAKE CONTROL COMMON
BRAKE CONTRO
MODEL 4116A-10
MODE SELECTOR
SWITCH (S4)
DETAIL
PCP
LCL
AZ-1
EL-1
AUX-1
AZ-2
EL-2
AUX-2
S4

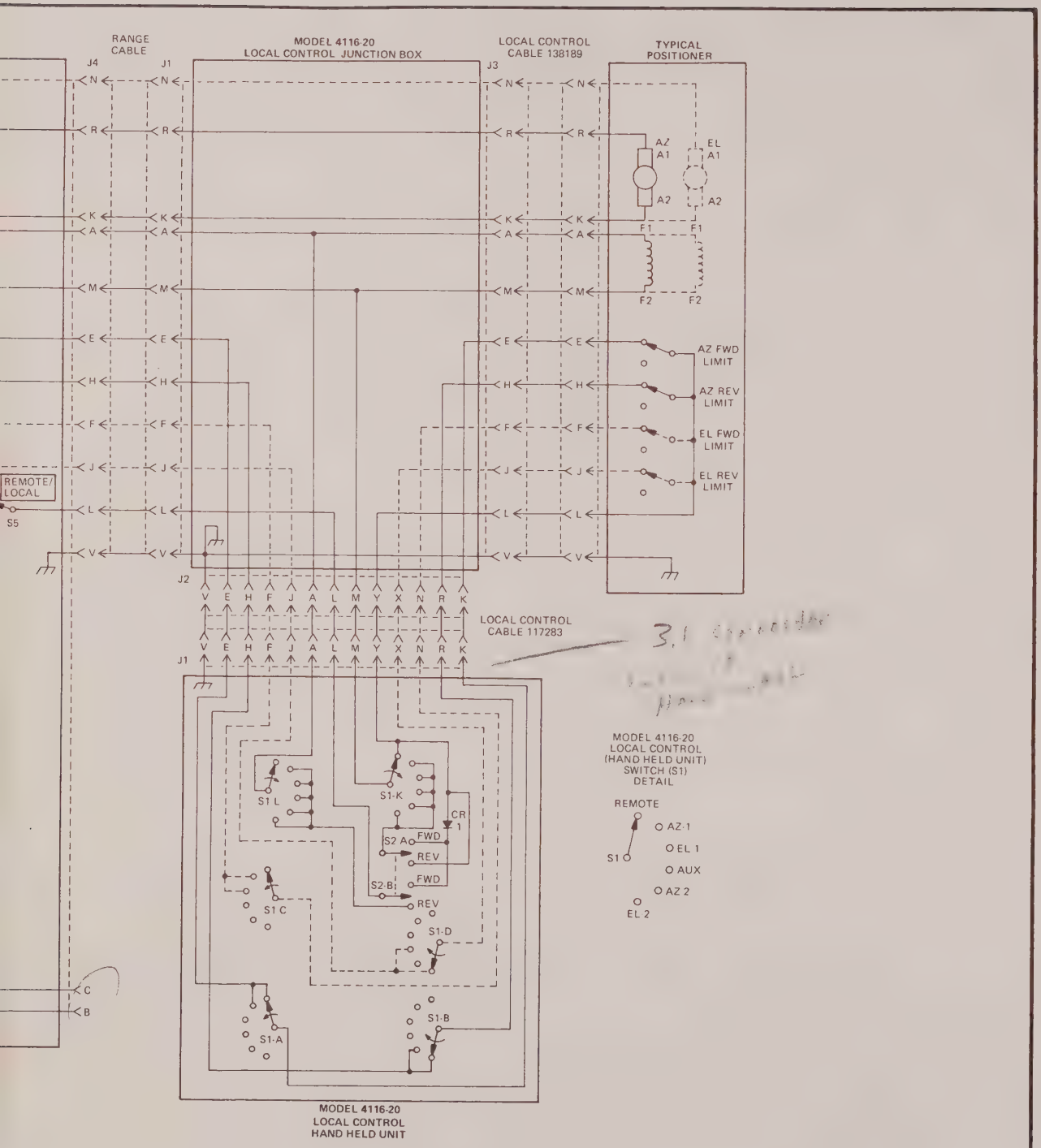


Figure 4-1. Model 4116A-10 Remote Control Unit with Model 4116-20 Local Control Unit, Simplified Diagram

4.2.1.1 The limit selector relays K9 (forward) and K10 (reverse) operate in parallel with K1 and K2 to provide the proper limit line connection to K3. When a limit switch in the positioner opens, relay K3 is de-energized and the NC contact of K3 closes, connecting resistor R3 across the armature. This resistor provides rapid dynamic braking of the drive motor armature. The value of R3 can be selected to provide maximum deceleration of the armature while limiting the braking torque to a safe value. This prevents possible mechanical damage to the test antenna that is mounted on the positioner.

4.2.2 Armature and Direction Circuits, Local Mode. To transfer armature control to the local control unit, the MODE SELECTOR switch must be placed in the LCL position.

4.2.2.1 When the local selector switch, S1, is switched from remote (RMT) to an axis, the limit common is broken by S1K and only one set of axes limits remain closed through section S1A-S1J. If the local control switch, S2, is held in the FORWARD position, field voltage F2 is connected through CR18 in the remote control unit to energize the local control relay K12, CR15, R9, and R10, to field voltage F1. When K12 energizes, field voltage F1 is connected from S4B through the normally closed contact of K11 to the forward relays K1 and K9. K1 connects the armature power to the normally open contact of K3 through K8. Diodes CR6 and CR7 protect the motor armature lines from direct shorts during switching of K1 and K2.

4.2.2.2 Depending on which axis limits were selected in the local control unit, S2A will provide a common limit through the positioner limits, selector switch S1, and limit selector relay (K9 and K10) to the proper armature control relay, K3 through K8.

4.2.2.3 When the armature relay is energized, armature power is provided to the selected motor armature. When S2 in the local control unit is released or a limit switch is energized, the limit line is opened and the armature relay is de-energized and dynamic braking is applied.

4.2.2.4 If S2, in the local control unit, has been held in the REVERSE position, F1 would have been connected through CR17 to K12. F1 would also be connected through normally open contact K12 to K11 and CR12 allowing K11 to be energized.

4.2.2.5 K11 is the Local-Program reversing relay which applies control from S4B to K2 and K10 (reversing relay) and power is applied across the armature in the opposing polarity.

4.2.3 Armature and Direction Circuit, PCP Mode. When the MODE SELECT switch in the remote control unit is in the PCP position, the unit can be controlled with a Scientific-Atlanta positioner programmer connected at J2. F1 is connected to J2M and through CR10, K12, K11 contacts to energize K1 and K9. If the programmer reversing circuit is energized, J2M is connected to J2D and reversing relay K11 is energized and K2 and K10 are energized.

4.2.3.1 The scan and step axis (ϕ-θ) are controlled by connecting J2M (common) to J2E for scan control or J2F for step control. Any one of the six axes can be used as the scan axis and any of the other axes can be used as the step axis. To accomplish this, insert the proper (SCAN and STEP) jumper on the printed wire board.

4.2.3.2 The simplified circuit diagrams in this manual show positioner No. 1 as being connected for programming, with the azimuth axis (AZ-1) connected as the ϕ axis and the elevation axis (EL-1) as the θ axis.

4.2.3.3 For information regarding the operation of the positioner unit with Scientific-Atlanta positioner programmers, refer to the programmer instruction manual.

4.2.4 Limit Switch Circuits.

4.2.4.1 Remote Mode. Normally closed switches in the antenna positioner hold in the axis selected relay until the limit is reached. At such time, the relay is de-energized, the drive motor is braked to a stop, and the appropriate limit indicator is illuminated. Assume the remote operation is in progress and the antenna is being rotated clockwise (forward) about the AUX-1 axis. (Typically, this axis might be used for polarization positioning. Other axes are similar.) Armature relay K5 is held in by the AUX-1 forward limit switch in the positioner. The drive motor continues to run until the preset limit is reached and the limit line is open, releasing K5. The indicator, DS2, is then illuminated from the positive terminal, F1, of the field supply through the coil resistance of K5 and CR32. Because DS2 is a neon glow lamp, its illuminating current is not sufficient to hold in K5. The circuit for lamp DS2 is shown in Figure 4-2. The normally closed limit switch is effectively connected in parallel with DS2, thereby preventing its illumination until the limit switch is opened.

4.2.4.2 Local Mode. Operation of the limit switch circuits in the local mode is similar to that in the remote mode, the only addition being of utilization of the lines for axis selection. The limit switch common line is derived from the negative terminal of the field supply through S2A (LOCAL), S1K (LOCAL), and the junction box.

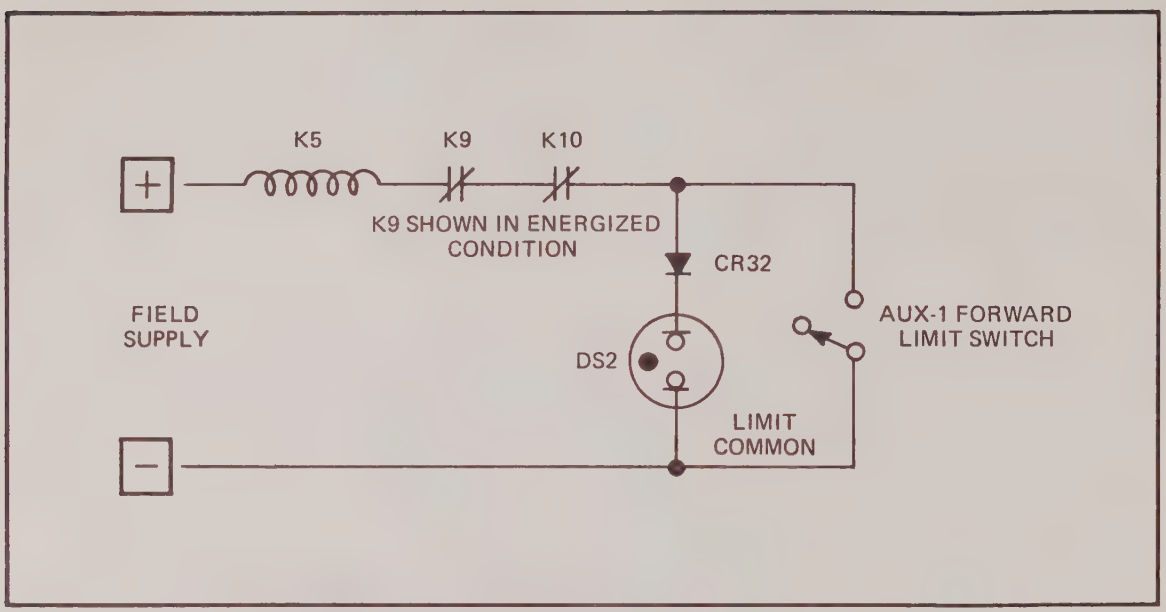


Figure 4-2. Model 4116A-10 Remote Control Unit, Simplified Lamp Circuit

4.2.5 Field Supply Circuit. Diode bridge CR2 constitutes the field supply, which is powered directly from the ac line. In addition to supplying a constant full-wave-rectified field voltage to the direct drive motors in the positioner, this supply provides the operating voltage for all the relays in the system. A surge protector, CR1, in parallel with the field supply output, prevents transients from damaging the diodes in the supply.

4.2.6 Additional Circuit Description. Diodes CR8 and CR9 are used to provide a control power source to the axis selector relays, K3 through K8, when operating in all modes except the program mode. Diodes, CR19 through CR23, are used to provide control power for K3 through K7 in LCL operation. Diodes, CR30 through CR41, are used for limit light indication. (These diodes may be used to provide limit jumpering.) Resistors R9, R10, R11, and 24-volt Zener diodes CR13 and CR14, provide a

center tap reference point, allowing K12 to operate from either F1 or F2. (R11 is used to limit peak current through CR13 and C14 since an unfiltered field supply is used.) Diodes CR15 through CR18 provide bidirection arc suppression of the K12 relay coil. Diode CR12 allows K11 to operate only a F1 (+) field voltage. Diodes CR6, CR7, CR11, and CR1 through CR8 on A2 card, are used to suppress relay coil transients when switched off.

4.2.6.1 Relays K13, K14, and diodes CR43 through CR50 are used to enable the use of two local control units (Model 4116-20) with one remote control unit (Model 4116A-10) when the local control is energized at J4. The local control used at J5 is interlocked and rendered inoperative until the FWD/REV switch on the local control is released. This circuit also keeps any undesired axis from operating while operating the desired axis. This is the same for the local control used through connector J5.

CHAPTER 5
MAINTENANCE

5.1 GENERAL

5.1.1 Due to proven circuit design and use of highly reliable components, maintenance of the Model 4116A-10 Remote Control Unit has been largely limited to regular cleaning and inspection. Discussions relative to semiconductor maintenance and instrument troubleshooting, and alignment procedures have also been included should malfunctions occur. When necessary, periodic maintenance and assistance can be provided through the nearest Scientific-Atlanta Regional Service Center. A list of regional service centers is provided on the last page of this chapter.

5.2 VISUAL INSPECTION

5.2.1 Periodically, the instrument should be inspected as follows:

WARNING

HAZARDOUS AC LINE VOLTAGES WILL BE EXPOSED DURING THE FOLLOWING PROCEDURE. PERSONNEL ARE ADVISED TO EXERCISE DUE CAUTION TO PREVENT PERSONAL INJURY.

a. Remove the cover from the unit.
b. Inspect all wiring and cables for frayed, loose, or burned wires.
c. Check cable connections, making sure the plugs are free from corrosion and are properly secured.

d. Check all components for evidence of overheating, breakage, vibration damage, corrosion, or loose connections.

e. Check capacitors and transformers for leaks, bulges, etc. (as appropriate).

5.3 CLEANING

5.3.1 The following procedure should be followed when cleaning the instrument during the course of maintenance operations:

WARNING

HAZARDOUS AC LINE VOLTAGES WILL BE EXPOSED DURING THE FOLLOWING PROCEDURE. PERSONNEL ARE ADVISED TO EXERCISE DUE CAUTION TO PREVENT PERSONAL INJURY.

a. Using a clean, lint-free cloth lightly moistened with an approved cleaning solvent, remove foreign matter from the case and front panel of the instrument. Wipe dry using a clean, dry, lint-free cloth.

b. Using a hand-controlled dry-air jet (not more than 15 ft.lbs/in^2), blow the dust from inaccessible areas. Care should be taken to prevent damage by the air blast.

c. Clean the electrical contacts of the connectors with a burnishing tool and/or cloth lightly moistened with an approved contact cleaner.

d. Clean the internal receptacles and printed circuit board contact "fingers" with a hand-controlled dry-air jet (not more than 15 ft.lbs/in^2), and a clean, lint-free cloth lightly moistened with an approved cleaning solvent. Wipe dry with a clean, dry, lint-free cloth.

5.4 SEMICONDUCTOR MAINTENANCE

NOTE

Due to a long life and exceptional reliability, it is recommended that semiconductors not be tested or replaced until unsatisfactory performance is observed.

5.4.1 Never remove or replace a semiconductor or circuit board containing semiconductors with the supply voltage turned on. Transients produced may damage semiconductors or other components remaining in the circuit. If a semiconductor is to be evaluated in an external circuit, take appropriate precautions to ensure the normal ratings of the semiconductor are not exceeded.

5.4.2 Use only low-heat soldering equipment when installing or removing soldered-in semiconductors. When removing a soldered-in semiconductor from a printed circuit board, first unbend the crimped leads. Use only the necessary amount of heat to unsolder the semiconductor. Clear excess solder from the mounting holes or eyelets before installing the replacement.

5.5 TROUBLESHOOTING

5.5.1 Should a malfunction occur in the operation of the equipment, a visual check of all cables, connectors, relays, and switches should be made.

5.5.2 If a relay contact is suspected as a possible source of trouble, a resistance check should be made through the closed contacts. Unplug the relay from its socket, connect an ohmmeter across the suspected contacts, and energize the coil from an external source. Contact resistance should be of the

order of 0.5 to 1 ohm and should remain relatively constant throughout each of ten normal operations.

5.5.3 Check the limit switches in the antenna positioner from proper operation. They should be replaced when their operation becomes erratic. Refer to the positioner instruction manual for replacement information.

5.5.4 Table 5-1 gives operating conditions for all the relays in the system during remote and local operation. The symbol "0" signifies that the relay in that column is de-energized for the condition indicated; "1" denotes that the relay is energized.

5.6 REGIONAL SERVICE CENTERS

5.6.1 Regional Service Centers capable of performing periodic maintenance and providing assistance associated with the Model 4116A-10 Remote Control Unit and other Scientific-Atlanta equipment are listed below: Service assistance for areas not listed can be provided through Scientific-Atlanta Service Department. For further information, contact Mr. Jim Cox, 3845 Pleasantdale Road, Atlanta, Georgia 30340; TEL: 404-449-2000; TWX: 810-766-4912; TELEX: 0542898.

NORTH AMERICAN SERVICE CENTERS

Southeastern Regional Service Center
3845 Pleasantdale Road
Atlanta, Georgia 30340
Tel: 404-449-2000

Washington D.C. Regional Service Center
Priest Bridge Business Park
2121 Baldwin Avenue, Suite 25A
Crofton, Maryland 21114
Tel: 301-261-3232

New England Regional Service Center
87 Terrace Hall Avenue
Burlington, Massachusetts 91803
Tel: 617-272-1256

Southwestern Regional Service Center
Suite 1131, Frito-Lay Tower
Dallas, Texas 75235
Tel: 214-357-4558

So. California Regional Service Center
10039 South Pioneer Blvd.
P.O. Box 2668
Santa Fe Springs, California 90670
Tel: 213-449-9411

EUROPEAN SERVICE CENTERS

Scientific-Atlanta (U.K.), Ltd.
1-7 Sunbury Cross Centre
Staines Road West
Sunbury on Thames
Middlesex, TW16 7BB, England
Tel: Sunbury on Thames 89751

Scientific-Atlanta (FRANCE) SARL
Centre d'Affaires Paris-Nord
Batiment Ampere No. 5
93153 Le Blanc-Mesnil, France
Tel: 931-6820, Paris

Table 5-1. Relay Operation Chart

1 = Energized 0 = De-energized

		Positioner Control Unit Relay							
Condition		K1	K2	* K3 K8	K9	K10	K11		K12
Forward Out of Limit		1	0	1	1	0	0		0
Forward In Limit		0	0	0	1	0	0		0
Reverse Out of Limit		0	1	1	0	1	0		0
Reverse In Limit		0	0	0	0	1	0		0
Forward Out of Limit		1	0	1	1	0	0		1
Forward In Limit		0	0	0	1	0	0		1
Off		0	0	0	0	0	0		0
Reverse Out of Limit		0	1	1	0	1	1		1
Reverse In Limit		0	0	0	0	1	1		1

*The condition of the selected axis relay is given. All other axis relays should be 0.

CHAPTER 6
PARTS LISTS

6.1 GENERAL

6.1.1 The parts list for a standard Model 4116A Remote Control Unit are included in this chapter. Replacement parts for standard options, if included, are an integral part of this list. Special modifications, or changes, if any, are described with an appropriate notice at the front of this manual.

6.2 EXPLANATION OF COLUMN HEADINGS

6.2.1 COMP DESIG. This column contains the assigned component or reference designation. This designation appears on the referenced figure. For the complete reference designation for a particular part or component, prefix the component designation with the designation at the heading or the page following "REF DESIG PREFIX".

6.2.2 S-A PART NO. The Scientific-Atlanta part number is listed in this column.

6.2.3 DESCRIPTION. A brief electrical and/or mechanical description of the component is contained in this column. Abbreviations used are given at the end of this chapter.

6.2.4 FSCM. The manufacturer's Federal Supply Code for Manufacturers codes are entered here. The code numbers are from the Federal Supply Code for Manufacturers Cataloguing Handbooks H4-1 (Code to Name) and H4-2 (Name to Code) effective on the publication data of this manual. Alphabetical codes may be

arbitrarily assigned to suppliers not listed in the H4 handbooks. Where no manufacturer is listed, an industry standard part is referenced with the appropriate description and specification given in the description and manufacturer's part number columns. Identifying codes are cross-referenced (code to name) at the end of this chapter, following the parts list abbreviations.

6.2.5 MFR PART NO. The number assigned to the part by the manufacturer is listed in this column.

6.3 ORDERING PARTS

6.3.1 When ordering replacement parts from Scientific-Atlanta, always include the Scientific-Atlanta part number, the part description, the unit serial number, unit name, subassembly name, part manufacturer, and manufacturer's part number.

6.4 PARTS SUBSTITUTION

6.4.1 Common components may differ from those shown in the parts list. This difference is due to the substitution of a more current part during assembly. In such cases, the type shown in the parts list or the type removed may be used as a replacement.

158441 MODEL 4116A-10 REMOTE CONTROL UNIT

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
A01	65580	CABLE ASSY MOTORS & LIMITS THREE AXIS		
A02	90757	CABLE ASSY MOTOR & LIMITS SINGLE AXIS		
A03	91064	CABLE ASSY MOTORS & LIMITS THREE AXIS		
A04	92433	CABLE ASSY MOTORS & LIMITS THREE AXIS		
A05	95746	CABLE ASSY POSITIONER CONTROL		
A06	98704	CABLE ASSY POSITIONER CONTROL		
A07	100300	CABLE ASSY MOTOR & LIMITS THREE AXIS		
A08	101795	CABLE ASSY POSITIONER CONTROL		
A09	101797	CABLE ASSY POSITIONER CONTROL		
A10	101798	CABLE ASSY POSITIONER CONTROL		
A11	102345	CABLE ASSY POSITIONER CONTROL		
A12	102802	CABLE ASSY CONTROL		
A13	102806	CABLE ASSY MOTORS & LIMITS		
A14	102815	CABLE ASSY POSITIONER CONTROL		
A15	102816	CABLE ASSY POSITIONER CONTROL		
A16	116259	CABLE ASSY POSITIONER CONTROL		
A17	131410	TRANSFORMER ASSY,STEPDOWN 1.5KVA 50/60HZ		
A18	132871	CABLE ASSY POSITIONER CONTROL		
A19	158352	COVER,TRANSFORMER-REMOTE CONTROL UNIT		
CR01	81844	VARISTOR 150V RMS .5 WATTS	24446	V150LA310A
CR02	83374	RECTIFIER ASSY 400V 30A	80211	MDA990-5
CR03	83374	RECTIFIER ASSY 400V 30A	80211	MDA990-5
CR04	81844	VARISTOR 150V RMS .5 WATTS	24446	V150LA310A
CR05	81844	VARISTOR 150V RMS .5 WATTS	24446	V150LA310A
CR06	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR07	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR08				
CR09				
CR10				
CR11		SEE PAGE 6-5		
CR12				
CR13				
CR14				
CR24				
CR25				
CR26		NOT ASSIGNED		
CR27				
CR28				
CR29				
CR30		SEE PAGE 6-5		
CR31				
DS01	71406	LAMP 115V SINGLE CONTACT BAYONET MIN	24446	NE 51
DS02	71406	LAMP 115V SINGLE CONTACT BAYONET MIN	24446	NE 51
DS03	71406	LAMP 115V SINGLE CONTACT BAYONET MIN	24446	NE 51
F01	71236	FUSE 10 AMP 250 VOLT	75915	3AB
F02	71230	FUSE 4 AMP SLO BLO	75915	3AG
F03	78700	FACTORY SELECTED VALUE		
F04	78700	FACTORY SELECTED VALUE		
F05	78700	FACTORY SELECTED VALUE		
F06	78700	FACTORY SELECTED VALUE		
F07	78700	FACTORY SELECTED VALUE		
F08	78700	FACTORY SELECTED VALUE		
J01	71015	CONN AC MDGT-THST MALE 3-COND 15A RECESD	74545	7486
J02	70912	CONNECTR 3102A 20 29S	02660	MS3102A-20-29S
J03	70870	CONNECTR 3102A 12S 3S	02660	MS3102A-12S-3S
J04	70928	CONNECTR 3102A 28 11S	02660	MS3102A-28-11S
J05	70928	CONNECTR 3102A 28 11S	02660	MS3102A-28-11S
K01	71810	RELAY 100VDC DPDT PLUG-IN	76854	5-89925-603
K02	71810	RELAY 100VDC DPDT PLUG-IN	76854	5-89925-603
K03	71810	RELAY 100VDC DPDT PLUG-IN	76854	5-89925-603
K04	71810	RELAY 100VDC DPDT PLUG-IN	76854	5-89925-603
K05	71810	RELAY 100VDC DPDT PLUG-IN	76854	5-89925-603
K06	71810	RELAY 100VDC DPDT PLUG-IN	76854	5-89925-603
K07	71810	RELAY 100VDC DPDT PLUG-IN	76854	5-89925-603
K08	71810	RELAY 100VDC DPDT PLUG-IN	76854	5-89925-603

158441 MODEL 4116A-10 REMOTE CONTROL UNIT

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
K09 K10	SEE PAGE 6-5			
P01	56930	CORD AC LINE, WITH FEMALE CONN 10A		
P02	70976	CONNECTR 3106A 20 29P	02660	MS3106A-20-29P
P03	70941	CONNECTR 3106A 12S 3P	02660	MS3106A-12S-3P
P04	70990	CONNECTR 3106A 28 11P	02660	MS3106A-28-11P
P05	70990	CONNECTR 3106A 28 11P	02660	MS3106A-28-11P
R01	74676	RESISTOR 100 OHM 10W	24681	VAL10
R02		NOT ASSIGNED		
R03	71830	RESISTOR 5 OHM 50W	44655	0400A
R04	71830	RESISTOR 5 OHM 50W	44655	0400A
R05	71830	RESISTOR 5 OHM 50W	44655	0400A
R06	71830	RESISTOR 5 OHM 50W	44655	0400A
R07	71830	RESISTOR 5 OHM 50W	44655	0400A
R08	71830	RESISTOR 5 OHM 50W	44655	0400A
R09 R10	SEE PAGE 6-6			
S01	72900	SWITCH TOG DPST AC 10A 250V	15605	7561K4
S02	72956	SWITCH LIMIT SP DT SCREW TERM LONG LIFE	91929	V3 601
S03	72956	SWITCH LIMIT SP DT SCREW TERM LONG LIFE	91929	V3 601
S04	86476	SWITCH ROT 4P 2-12 POS NSH		PA-2013
S05	83291	SWITCH TOG DPDT LOCKING MIN	09353	7201KYZQE
S06	83291	SWITCH TOG DPDT LOCKING MIN	09353	7201KYZQE
T01	72224	XFMR IN 120V 50/60HZ OUT 0-140V 6A	24655	W5

151468 CONTROL CIRCUIT PCB ASSY

REF DESIG PREFIX A1

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
CR01				
CR02				
CR03				
CR04		SEE PAGE 6-3		
CR05				
CR06				
CR07				
CR08	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR09	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR10	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR11	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR12	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR13	75358	DIODE 2VR24A SI ZEN 24V 5% 2W	84970	2VR24A
CR14	75358	DIODE 2VR24A SI ZEN 24V 5% 2W	84970	2VR24A
CR15	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR16	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR17	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR18	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR19	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR20	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR21	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR22	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR23	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR24	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR25				
CR26				
CR27		SEE PAGE 6-3		
CR28				
CR29				
CR30	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR31	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR32	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR33	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR34	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR35	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR36	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR37	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR38	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR39	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR40	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR41	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR42	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR43	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR44	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR45	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR46	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR47	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR48	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR49	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR50	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR51	75358	DIODE 2VR24A SI ZEN 24V 5% 2W	84970	2VR24A
CR52	75358	DIODE 2VR24A SI ZEN 24V 5% 2W	84970	2VR24A
K01				
K02				
K03				
K04		SEE PAGE 6-3		
K05				
K06				
K07				
K08				
K09	81724	RELAY 115VDC 6PDT PLUG-IN BIF CON ENCL	70309	T163-6C 115VDC
K10	81724	RELAY 115VDC 6PDT PLUG-IN BIF CON ENCL	70309	T163-6C 115VDC
K11	75529	RELAY 48VDC 4PDT PLUG-IN BIF CON ENCL	70309	T163-4C
K12	75529	RELAY 48VDC 4PDT PLUG-IN BIF CON ENCL	70309	T163-4C
K13	75529	RELAY 48VDC 4PDT PLUG-IN BIF CON ENCL	70309	T163-4C
K14	75529	RELAY 48VDC 4PDT PLUG-IN BIF CON ENCL	70309	T163-4C
R01				
R02		SEE PAGE 6-4		
R03				

151468 CONTROL CIRCUIT PCB ASSY

REF DESIG PREFIX A1

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
R04 R05 R06 R07 R08	SEE PAGE 6-4			
R09	75666	RESISTOR 5.6K OHM 2W 1% COMP	01121	RCR42G562KS
R10	75666	RESISTOR 5.6K OHM 2W 1% COMP	01121	RCR42G562KS
R11	71909	RESISTOR 220 OHM 1W 10% COMP	01121	RCR32G221KS
R12	75666	RESISTOR 5.6K OHM 2W 1% COMP	01121	RCR42G562KS
R13	75666	RESISTOR 5.6K OHM 2W 1% COMP	01121	RCR42G562KS
R14	71909	RESISTOR 220 OHM 1W 10% COMP	01121	RCR32G221KS

220585 TRANSIENT SUPPRESSOR PCB ASSY

REF DESIG PREFIX A2

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
CR01	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR02	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR03	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR04	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR05	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR06	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR07	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
CR08	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484

117317 MODEL 4116-2C LCCAL CONTROL UNIT

REF DESIG PREFIX A3

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
CR01	71132	DIODE 1N2484 SIL 600V 1A	84970	1N2484
J01	75294	CONNECTR 3102E 28 12P	02660	MS3102E-28-12P
S01	81842	SWITCH ROT 12P 6 POS NSH 3 SEC 15 DEG	01686	34-ECB-6
S02	81843	SWITCH TOG DPDT ON/MOM-OFF-ON/MOM	04009	84115

117281 MODEL 4116-2C LOCAL CONTROL JUNCTION BOX

REF DESIG PREFIX A4

COMP DESIG	S-A PART NO	DESCRIPTION	FSCM	MFR PART NO
J01	70926	CONNECTR 3102A 28 11P	02660	MS3102A-28-11P
J02	70932	CONNECTR 3102A 28 12S	02660	MS3102A-28-12S
J03	70928	CONNECTR 3102A 28 11S	02660	MS3102A-28-11S

FSCM-MANUFACTURER CROSS REFERENCE

FSCM	MANUFACTURER		
01121	ALLEN-BRADLEY CO	MILWAUKEE	WISC
01686	RCL ELECTRONICS INC	MANCHESTER	NH
02660	AMPHENOL CORP	BROADVIEW	ILL
04009	ARROW-HART & HEGEMAN ELEC	HARTFORD	CONN
09353	C & K COMPONENTS INC	NEWTON	MA
15605	CUTLER-HAMMER INC	MILWAUKEE	WISC
24446	GENERAL ELECRIC CO	SCHENECTADY	NY
24655	GENERAL RADIO CO	W CONCORD	MASS
24681	MEMCOR INC COMPONENTS DIV/TRU-OHM/	HUNTINGTON	IND
44655	OHMITE MFG CO	SKOKIE	ILL
70309	ALLIED CONTROL CO	NEW YORK	NY
74545	HARVEY HUBBELL INC	BRIDGEPORT	CONN
75915	LITTLEFUSE INC	DES PLAINES	ILL
76854	OAK MFG-DIV OAK ELECTRO/NETICS	CRYSTAL LAKE	ILL
80211	MOTOROLA INC	CHICAGO	ILL
84970	SARKES TARZIAN INC	BLOOMINGTON	IND
86797	ROGAN BROTHERS INC	SKOKIE	ILL
91929	MICRO SWITCH	FREEPORT	ILL
95146	ALCO ELECTRONICS MFG CO	LAWRENCE	MASS

CHAPTER 7
DIAGRAMS

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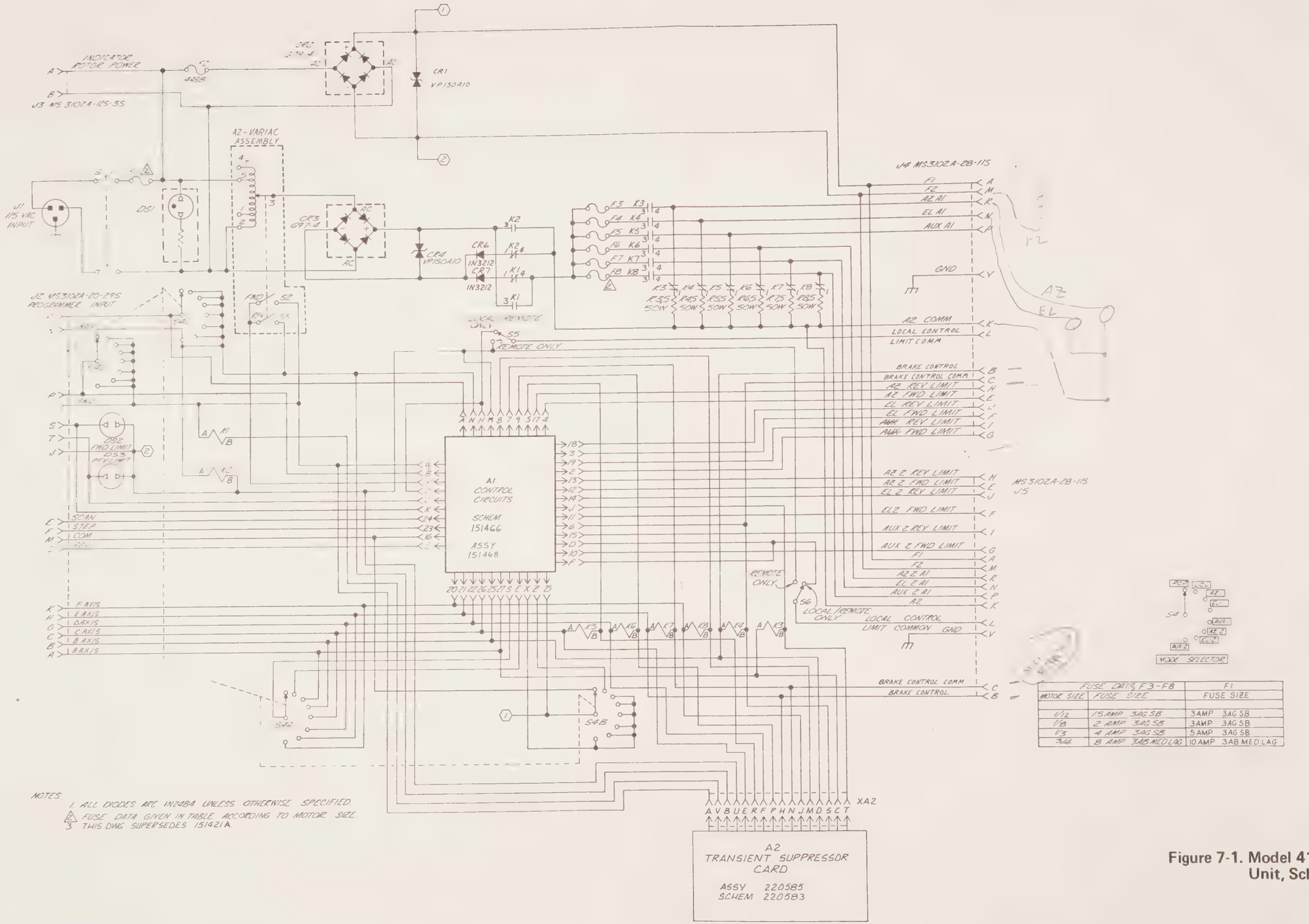
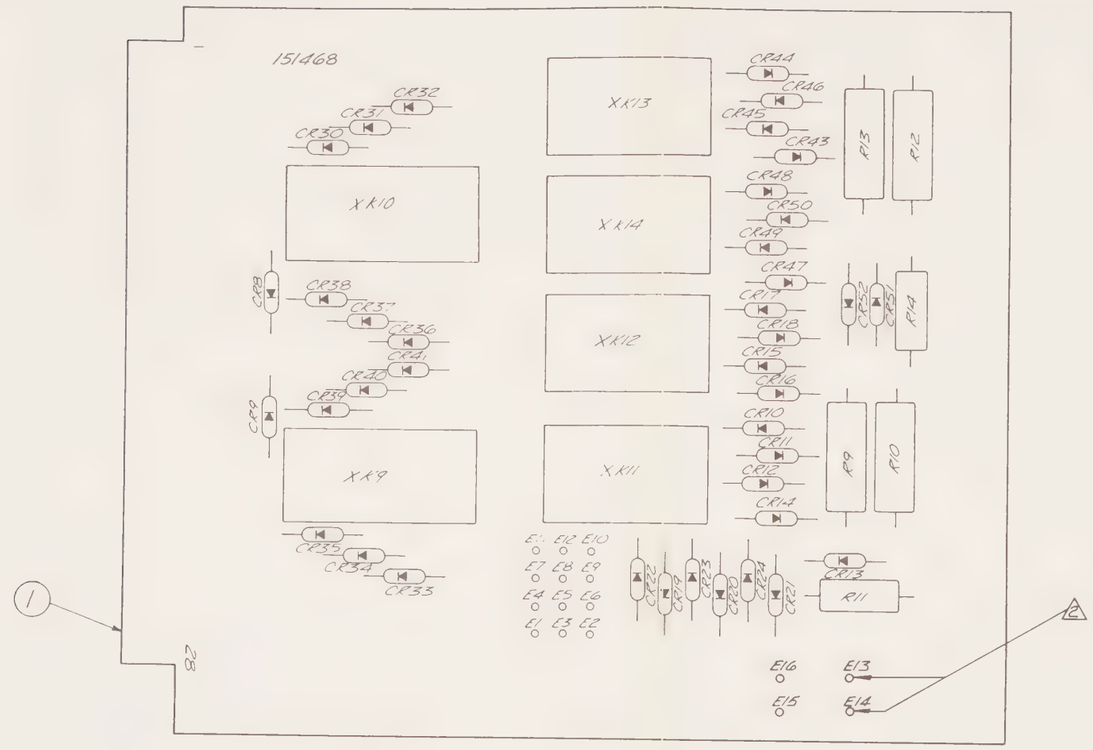


FUSE DATA, F3-F8		F1
MOTOR SIZE	FUSE SIZE	FUSE SIZE
1/12	1.5 AMP 3AG SB	3 AMP 3AG SB
1/8	2 AMP 3AG SB	3 AMP 3AG SB
1/3	4 AMP 3AG SB	5 AMP 3AG SB
3/4	8 AMP 3AB MED LAG	10 AMP 3AB MED LAG

NOTES:
1. ALL DIODES ARE IN2484 UNLESS OTHERWISE SPECIFIED.
2. FUSE DATA GIVEN IN TABLE ACCORDING TO MOTOR SIZE.
3. THIS DWG SUPERSEDES 151421A.

Figure 7-1. Model 4116A-10 Remote Control Unit, Schematic Diagram



NOTES:
1. K9-K14 MOUNT IN XK9-XK14 RESPECTIVELY.
2. CONNECT E13 TO E15 AND E14 TO E16 WITH BUS WIRE WHEN OPERATING A FOUR OR FIVE AXIS POSITIONER WITH A MODEL 4116-20 LOCAL CONTROL UNIT.

Figure 7-2. Model 4116A-10 Remote Control Unit, Printed Circuit Board (A1), Component Location

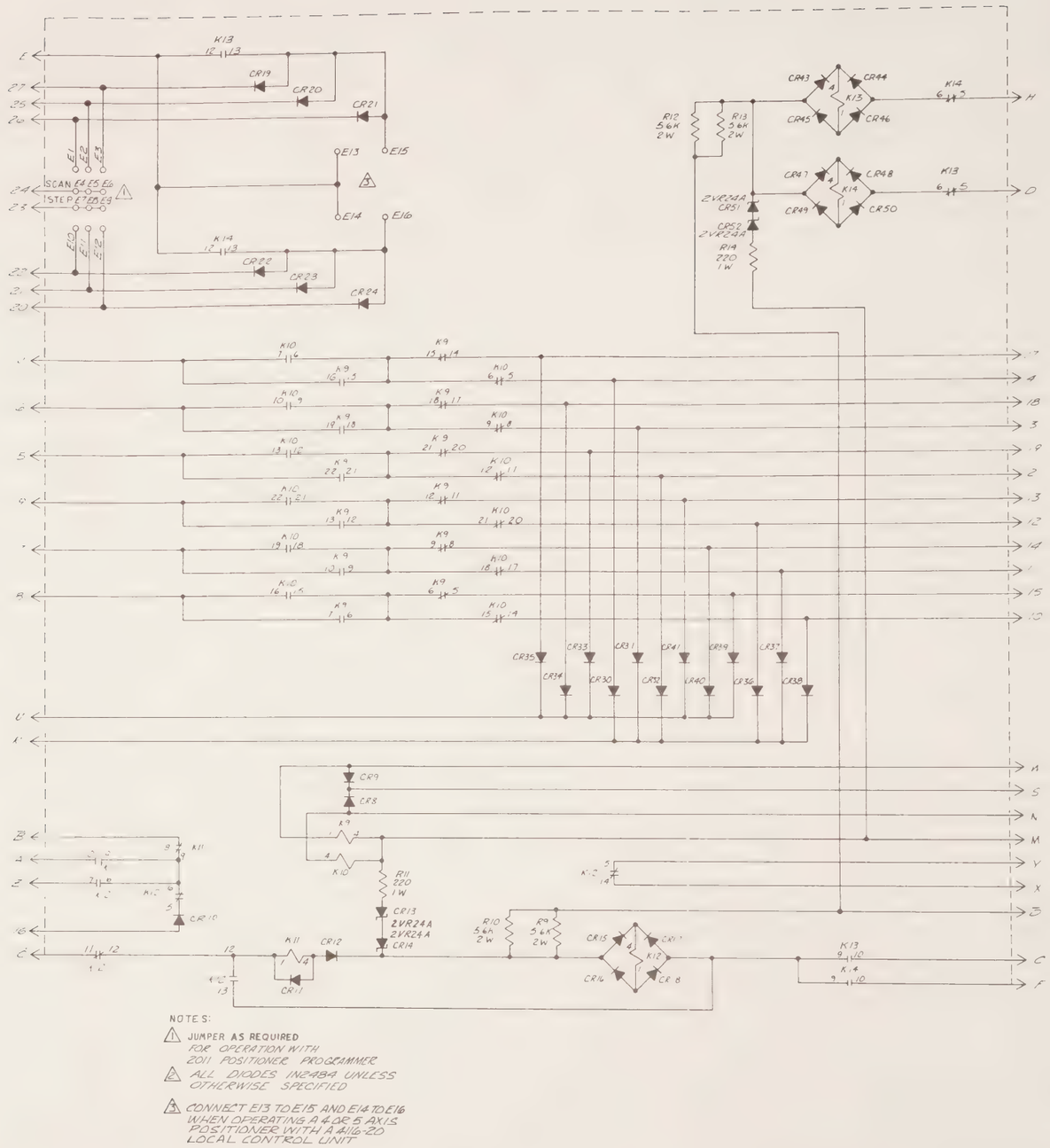
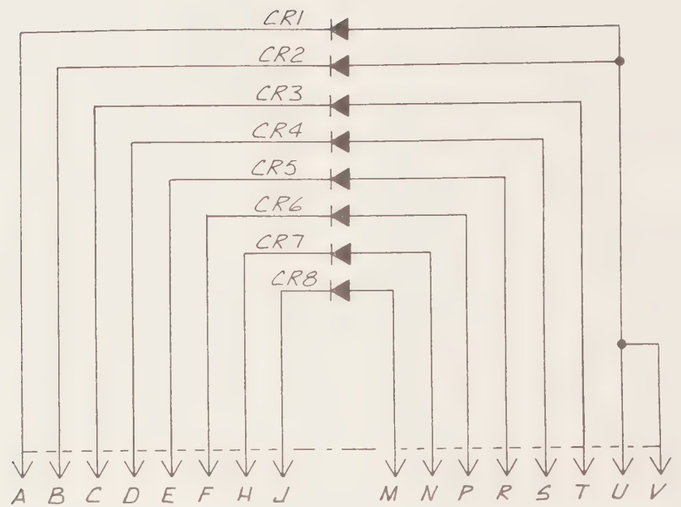


Figure 7-3. Model 4116A-10 Remote Control Unit, Control Circuits Printed Circuit Board (A1), Schematic Diagram

Figure 7-4. Model 4116A Control Unit, Transient Suppressor Printed Circuit Board (A2), Component Location

220585
50E027D



NOTES:
1. CR1 THRU CR8 ARE IN2484 DIODES.

Figure 7-5. Model 4116A Control Unit, Transient Suppressor Printed Circuit Board (A2), Schematic Diagram

220583

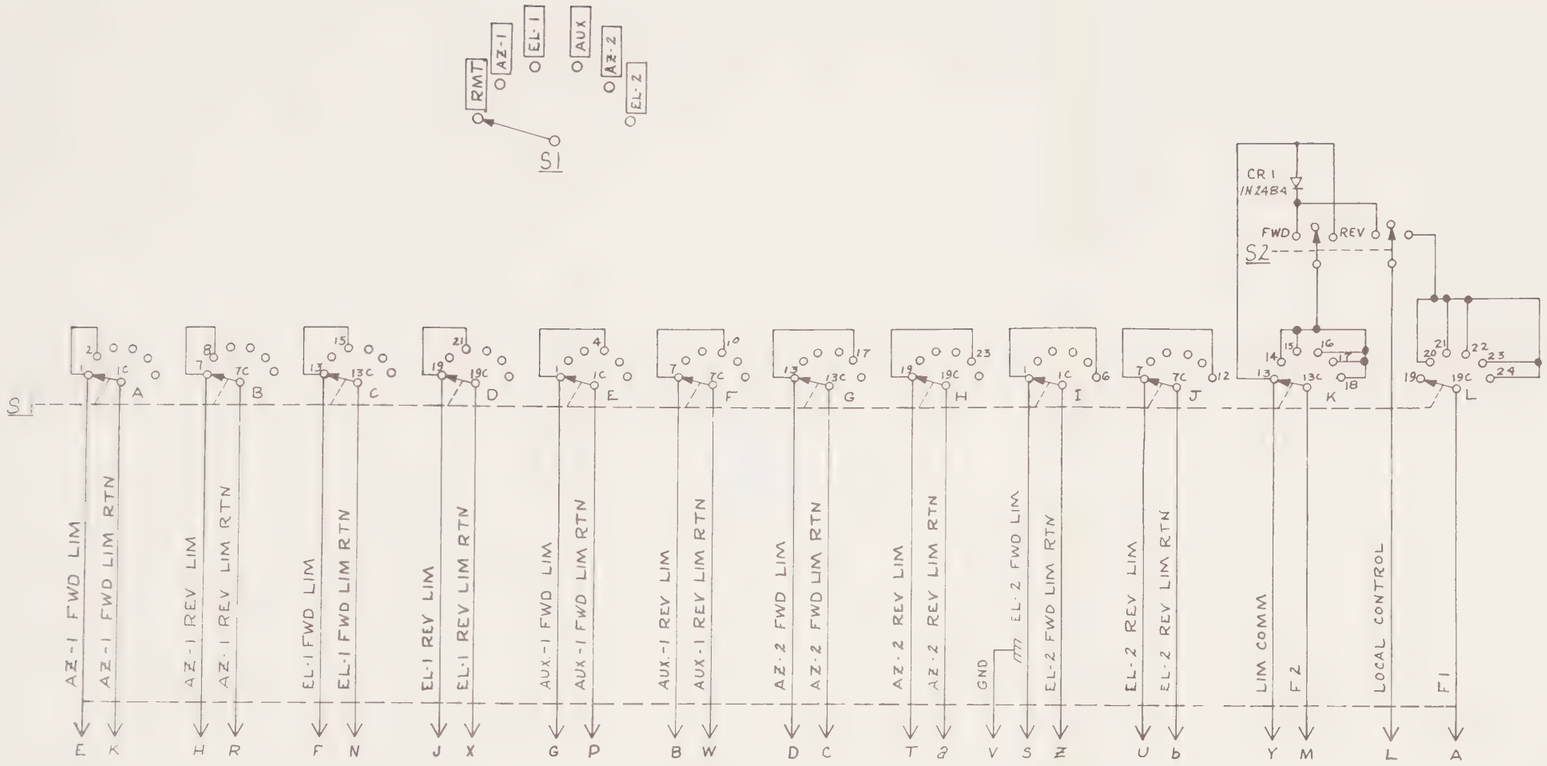


Figure 7-6. Model 4116A-20 Local Control Unit, Schematic Diagram

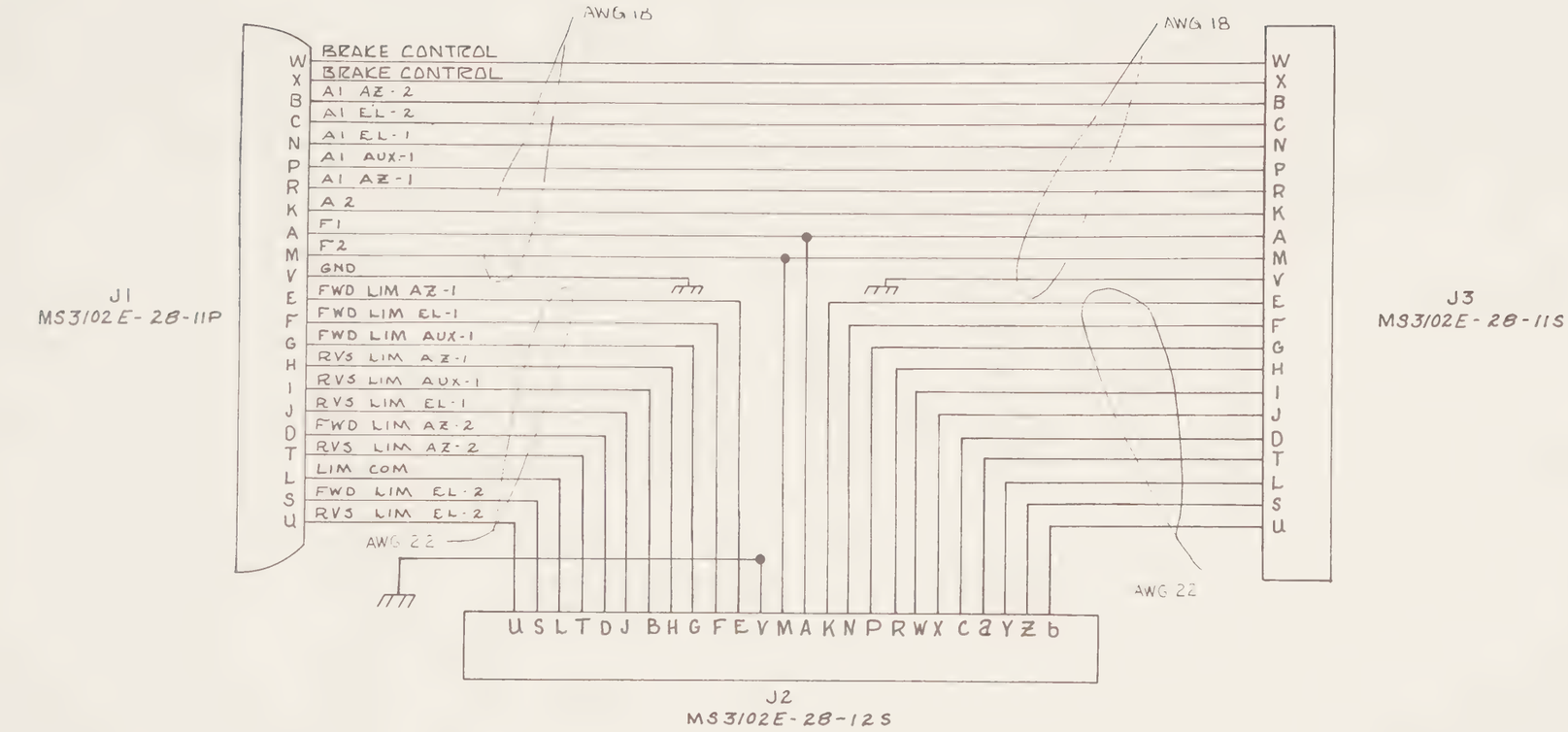
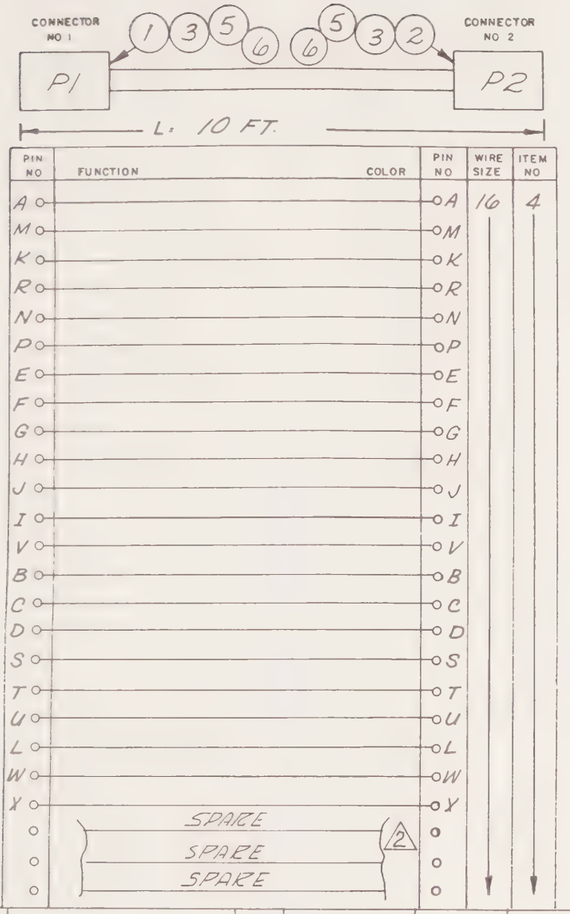


Figure 7-7. Model 4116A-20 Local Control Unit Junction Box, Schematic Diagram

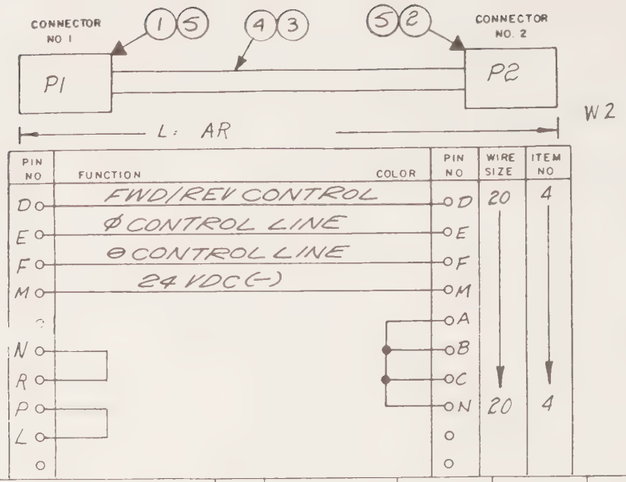


QTY REQ'D	ITEM NO	NOMENCLATURE OR DESCRIPTION	MFG	IDENTIFYING OR PART NO	MATERIAL	STOCK SIZE	MATL SPEC
2	6	BOOT, SHRINKABLE		86481			
2	5	CONNECTOR ADAPTER		86480			
A/R	4	CABLE, 16 AWG, 25 CONDUCTOR T-6661		86849			
	3						
1	2	CONNECTOR MS 3106E-28-11P		86399			
1	1	CONNECTOR MS 3106E-28-11S		86396			

LIST OF MATERIALS OR PARTS LIST

NOTE: 1. ASSEMBLE ACCORDING TO PROCESS SPEC. 158482.
2. CUT OFF SPARE WIRES EVEN WITH OUTER JACKET.

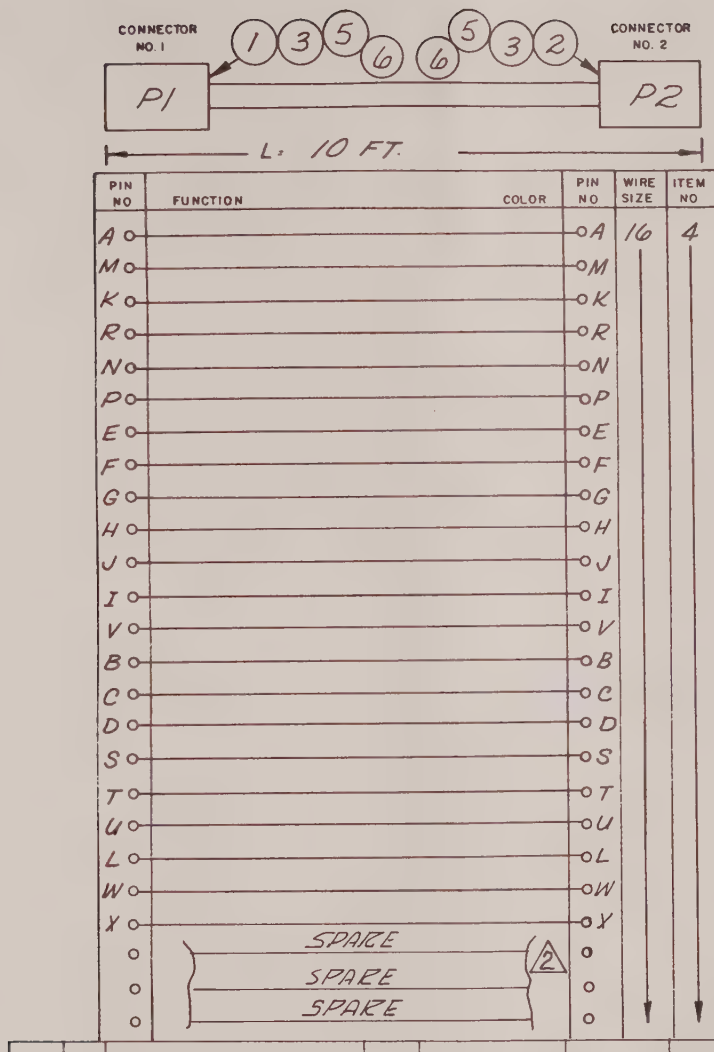
Figure 7-8. Model 4116A-10 Remote Control Unit, Interconnecting Cable No. 38189 Diagram



QTY REQ'D	ITEM NO	NOMENCLATURE OR DESCRIPTION	MFG	IDENTIFYING OR PART NO	MATERIAL	STOCK SIZE	MATL SPEC
2	5	CABLE, CLAMP AN3057-12A		70778			
AR	4	WIRE, NO. 20		73374			
AR	3	TUBING, BLACK, PVC-105		75931			
1	2	CONNECTOR, MS3106A-20-29S		70977			
1	1	CONNECTOR, MS3106A-20-29P		70976			

LIST OF MATERIALS OR PARTS LIST

Figure 7-9. Model 4116A-10 Remote Control Unit, Interconnecting Cable No. 40838 Diagram

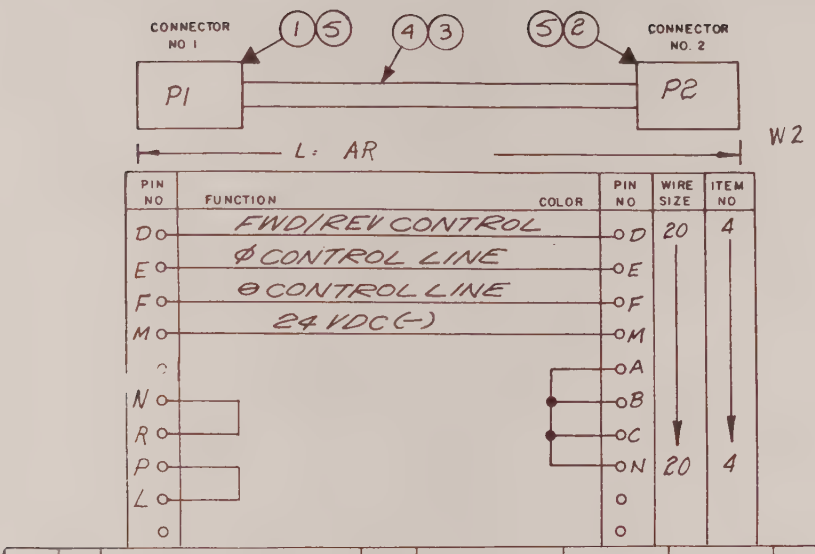


QTY REQ'D	ITEM NO	NOMENCLATURE OR DESCRIPTION	MFG	IDENTIFYING OR PART NO	MATERIAL	STOCK SIZE	MATL SPEC
2	6	BOOT, SHRINKABLE		86481			
2	5	CONNECTOR ADAPTER		86480			
A/R	4	CABLE, 16 AWG, 25 CONDUCTOR T-6661		86849			
	3						
1	2	CONNECTOR MS 3106E-28-11P		86399			
1	1	CONNECTOR MS 3106E-28-11S		86396			

LIST OF MATERIALS OR PARTS LIST

NOTE: 1. ASSEMBLE ACCORDING TO PROCESS SPEC. 158482.
2. CUT OFF SPARE WIRES EVEN WITH OUTER JACKET.

Figure 7-8. Model 4116A-10 Remote Control Unit, Interconnecting Cable No. 38189 Diagram

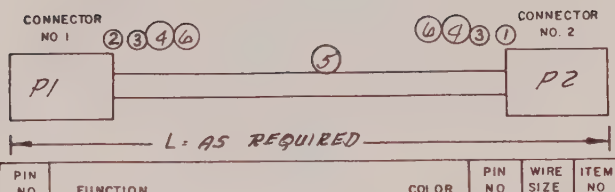


QTY REQ'D	ITEM NO	NOMENCLATURE OR DESCRIPTION	MFG	IDENTIFYING OR PART NO	MATERIAL	STOCK SIZE	MATL SPEC
2	5	CABLE, CLAMP AN3057-12A		70778			
AR	4	WIRE, NO. 20		73374			
AR	3	TUBING, BLACK, PVC-105		75931			
1	2	CONNECTOR, MS3106A-20-29S		70977			
1	1	CONNECTOR, MS3106A-20-29P		70976			

LIST OF MATERIALS OR PARTS LIST

Figure 7-9. Model 4116A-10 Remote Control Unit, Interconnecting Cable No. 40838 Diagram

40838C

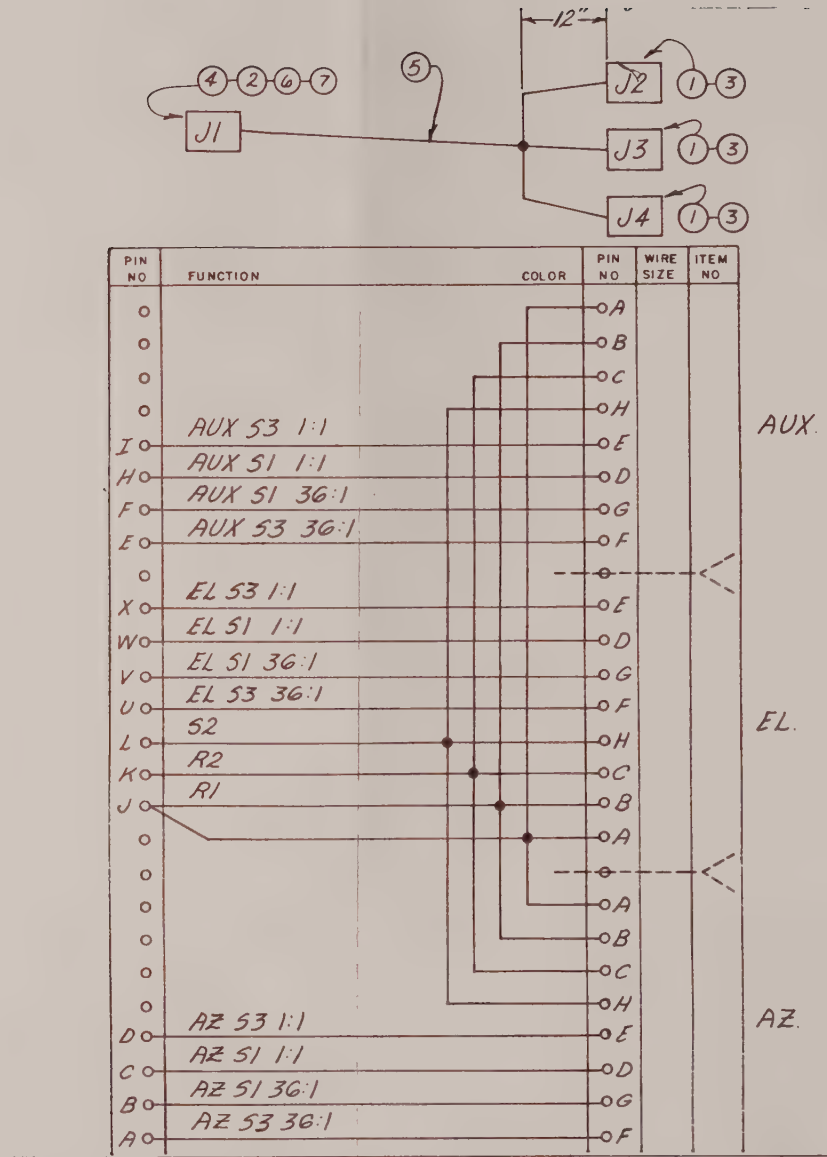


PIN NO	FUNCTION	COLOR	PIN NO	WIRE SIZE	ITEM NO
A	F1		A		
E	AZIMUTH FORWARD LIMIT		E		
F	ELEVATION FORWARD LIMIT		F		
G	AUXILIARY FORWARD LIMIT		G		
H	AZIMUTH REVERSE LIMIT		H		
I	AUXILIARY REVERSE LIMIT		I		
J	ELEVATION REVERSE LIMIT		J		
K	ALL A2		K		
L	LIMIT COMMON		L		
M	ALL F2		M		
N	ELEVATION A1		N		
P	AUXILIARY A1		P		
R	AZIMUTH A1		R		
V	GROUND		V		

QTY REQ'D	ITEM NO	NOMENCLATURE OR DESCRIPTION	MFG	IDENTIFYING OR PART NO	MATERIAL	STOCK SIZE	MATL SPEC.
2	6	CONNECTOR ADAPTER		86480			
A/R	5	CABLE 14 COND. #16		76516			
2	4	SHRINKABLE BOOT		86481			
2	3	CLAMP & BUSHING		77466			
1	2	CONNECTOR MS-3106E-28-11S		86396			
1	1	CONNECTOR MS-3106E-28-11P		86399			

LIST OF MATERIALS OR PARTS LIST

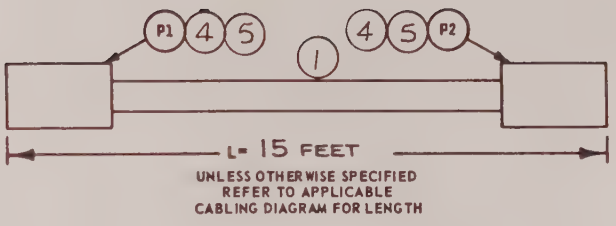
Figure 7-10. Model 4116A-10 Remote Control Unit, Interconnecting Cable No. 91064 Diagram

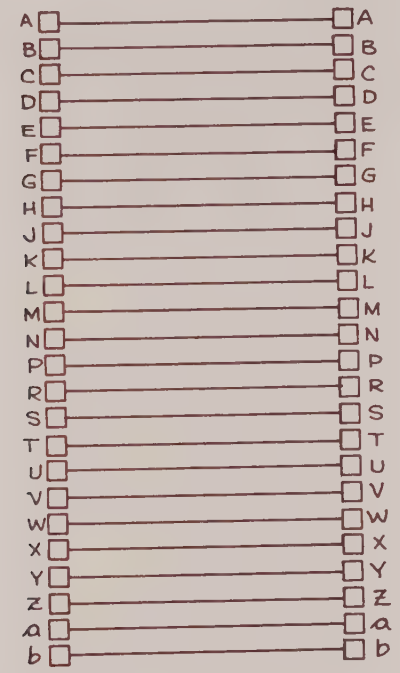


QTY REQ'D	ITEM NO	NOMENCLATURE OR DESCRIPTION	MFG	IDENTIFYING OR PART NO	MATERIAL	STOCK SIZE	MATL SPEC
1	7	CONNECTOR ADAPTER		86480			
1	6	SHRINKABLE BOOT		86481			
AR	5	CABLE, 16 COND. S.O.		76510		AWG No. 16	
1	4	CLAMP AN-3057-20		77466			
3	3	CLAMP AN-3057-12A		70778			
1	2	CONNECTOR MS-3106E 28-11S(X)		86438			
3	1	CONNECTOR MS-3106E-20-7P		86436			

LIST OF MATERIALS OR PARTS LIST

Figure 7-11. Model 4116A-10 Remote Control Unit, Interconnecting Cable No. 94736 Diagram





ITEM OR FIND NO.	QTY REQD	S-A STOCK NO.	NOMENCLATURE OR DESCRIPTION	MATL SPEC AND SIZE OR COMPONENT VALUE	IDENTIFYING OR PART NO	CODE IDENT
5	2	86481	BOOT, SHRINKABLE			
4	2	86480	CONNECTOR ADAPTER			
3						
2						
1	AR	86849	CABLE		25 COND # 16	
P2	1	78184	CONNECTOR		MS3106E-28-12S	
P1	1	78183	CONNECTOR		MS3106E-28-12P	

PARTS LIST

Figure 7-12. Model 4116A-10 Remote Control Unit, Interconnecting Cable No. 117283 Diagram

CHAPTER 8
SUPPLEMENTAL INFORMATION

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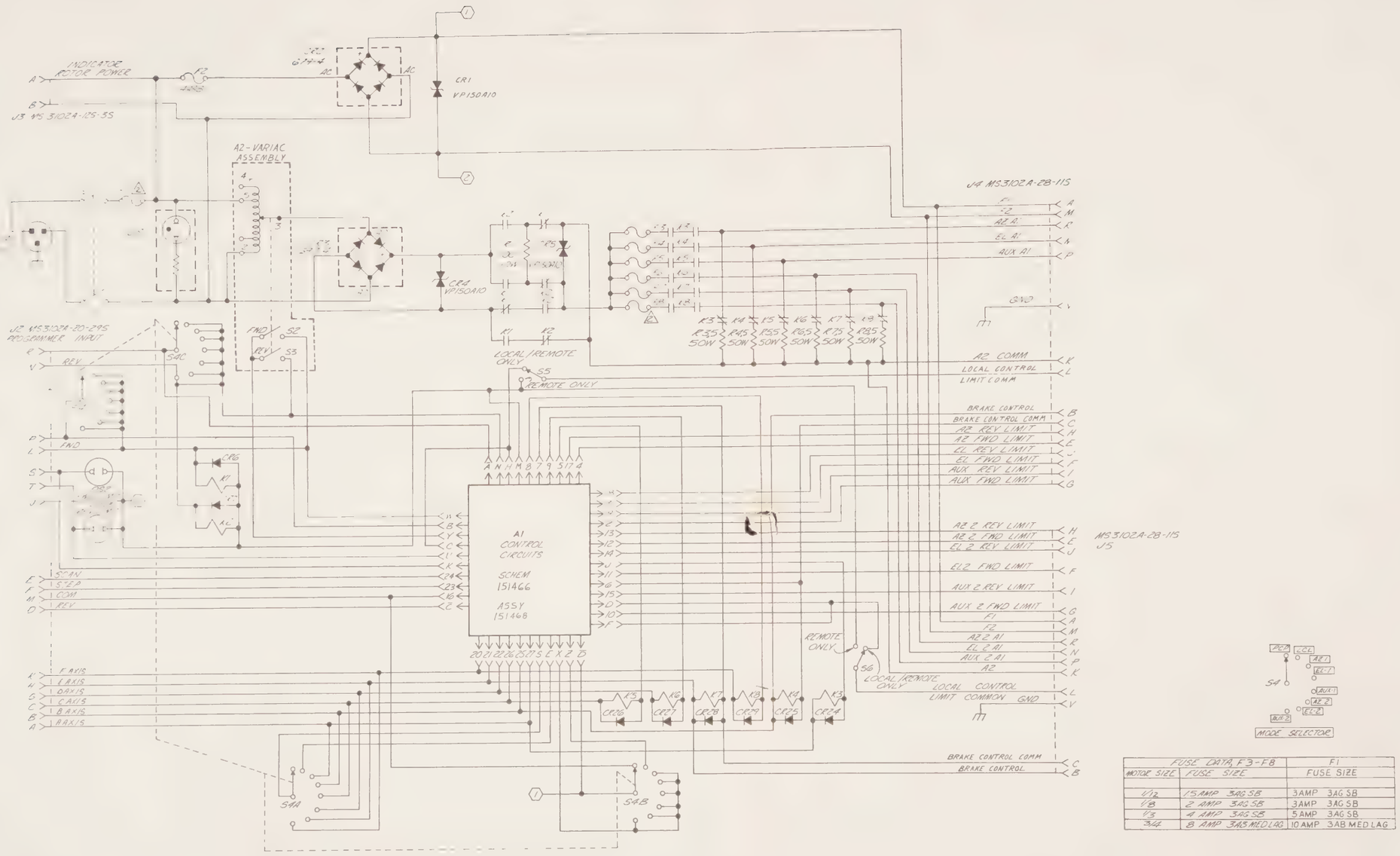
8.0 GENERAL

8.0.1 This chapter provides reference information documenting some of the changes made to the Model 4116A Control Unit. A synopsis of Safety Procedures, Service Bulletins, and original diagrams (when different from those provided in Chapter 7) will be entered in this chapter on general revisions of this Instruction Manual. The Instrumentation Publication Department of Scientific-Atlanta welcomes comments from equipment users. This chapter will also provide tips and techniques applicable to this equipment when provided from interested users. Our mailing address is:

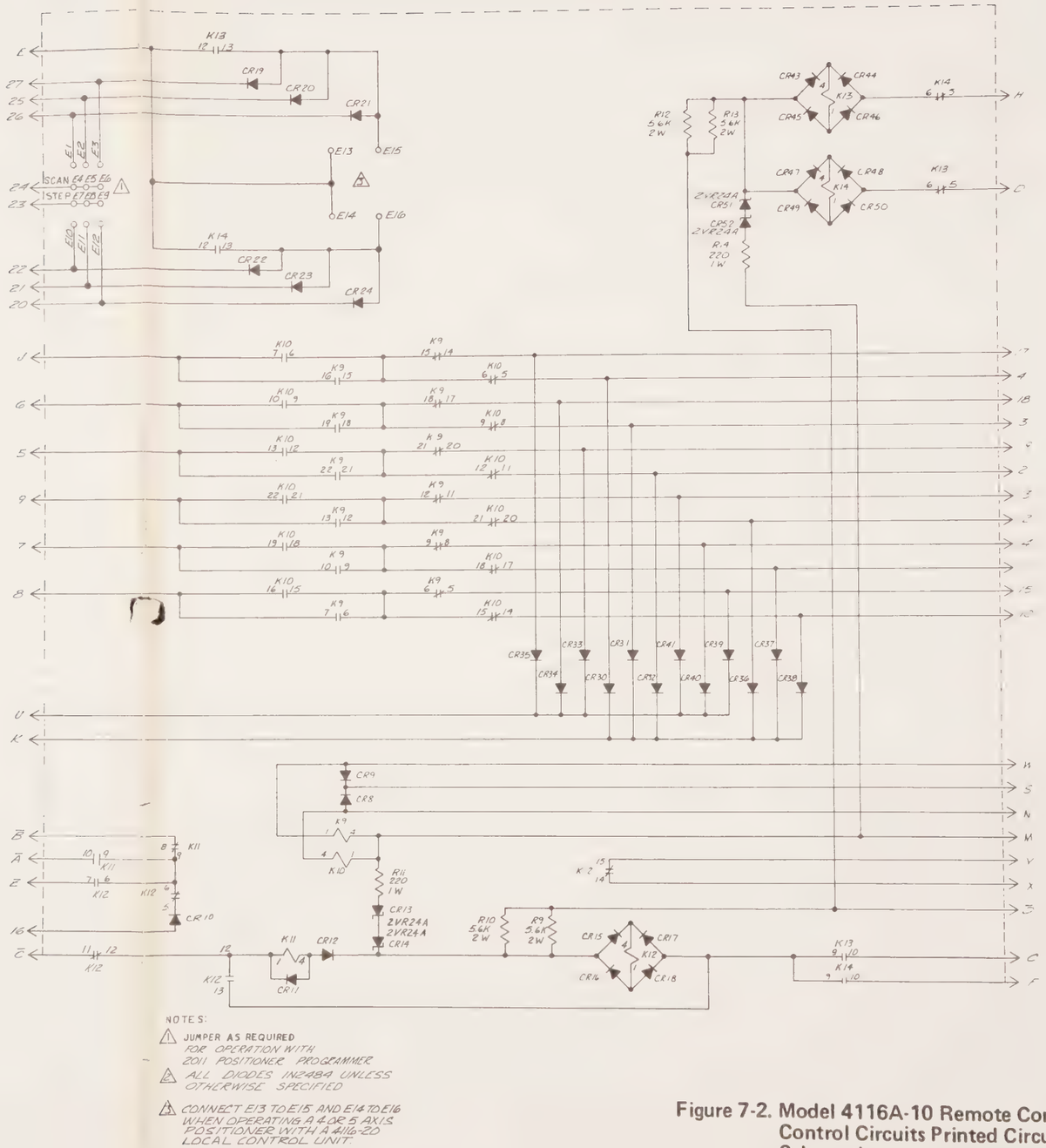
Scientific-Atlanta
Instrumentation Publications; I-3
3845 Pleasantdale Road
Atlanta, GA 30340



FUSE DATA, F3-F8		F1
MOTOR SIZE	FUSE SIZE	FUSE SIZE
1/12	1.5 AMP 3AG SB	3 AMP 3AG SB
1/8	2 AMP 3AG SB	3 AMP 3AG SB
1/3	4 AMP 3AG SB	5 AMP 3AG SB
3/4	8 AMP 3AB MED LAG	10 AMP 3AB MED LAG

NOTES
1. ALL DIODES ARE IN2484 UNLESS OTHERWISE SPECIFIED.
2. FUSE DATA GIVEN IN TABLE ACCORDING TO MOTOR SIZE.

Figure 7-1. Model 4116A-10 Remote Control Unit, Schematic



NOTES:

⚠1 JUMPER AS REQUIRED FOR OPERATION WITH 2011 POSITIONER PROGRAMMER

⚠2 ALL DIODES IN2484 UNLESS OTHERWISE SPECIFIED

⚠3 CONNECT E13 TO E15 AND E14 TO E16 WHEN OPERATING A 4 OR 5 AXIS POSITIONER WITH A 4116-20 LOCAL CONTROL UNIT.

Figure 7-2. Model 4116A-10 Remote Control Unit, Control Circuits Printed Circuit Board, Schematic

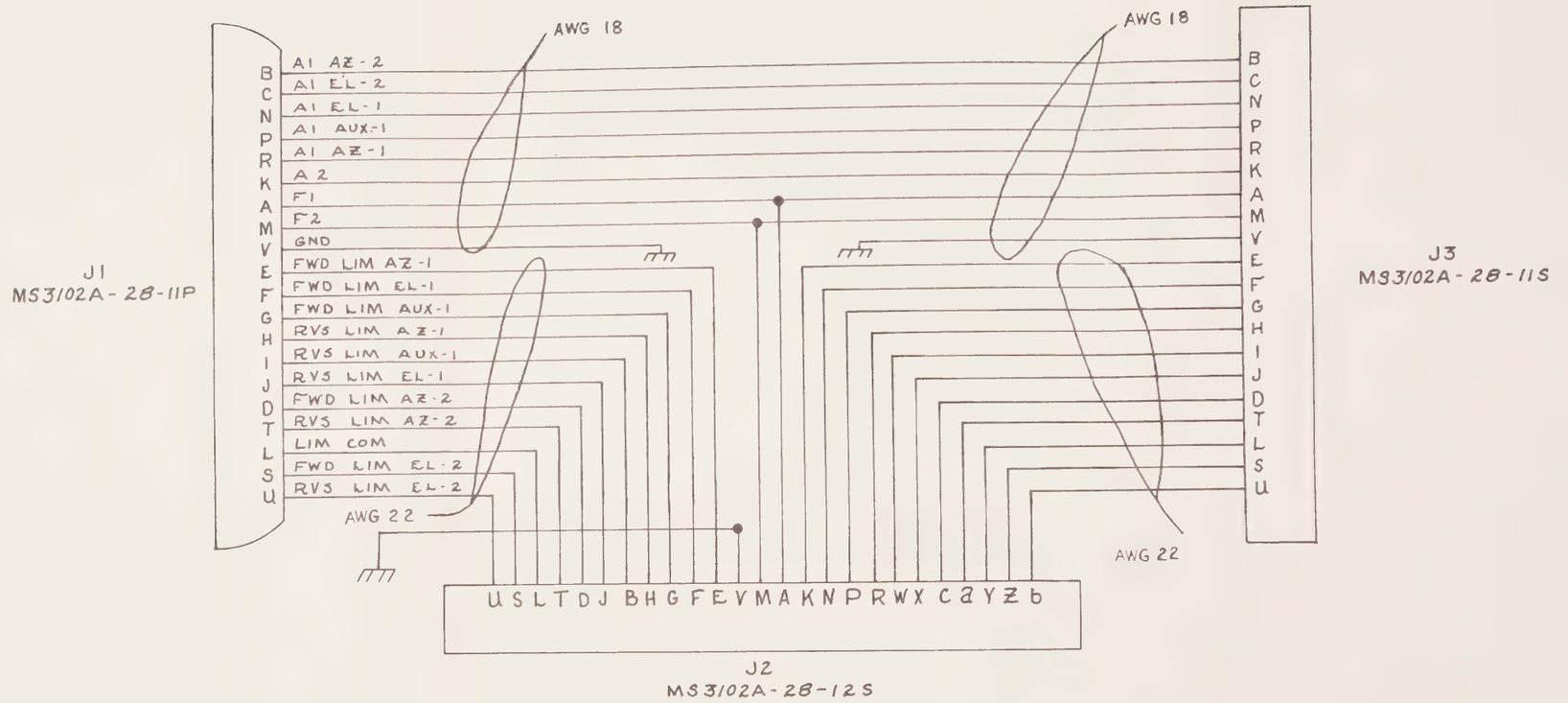
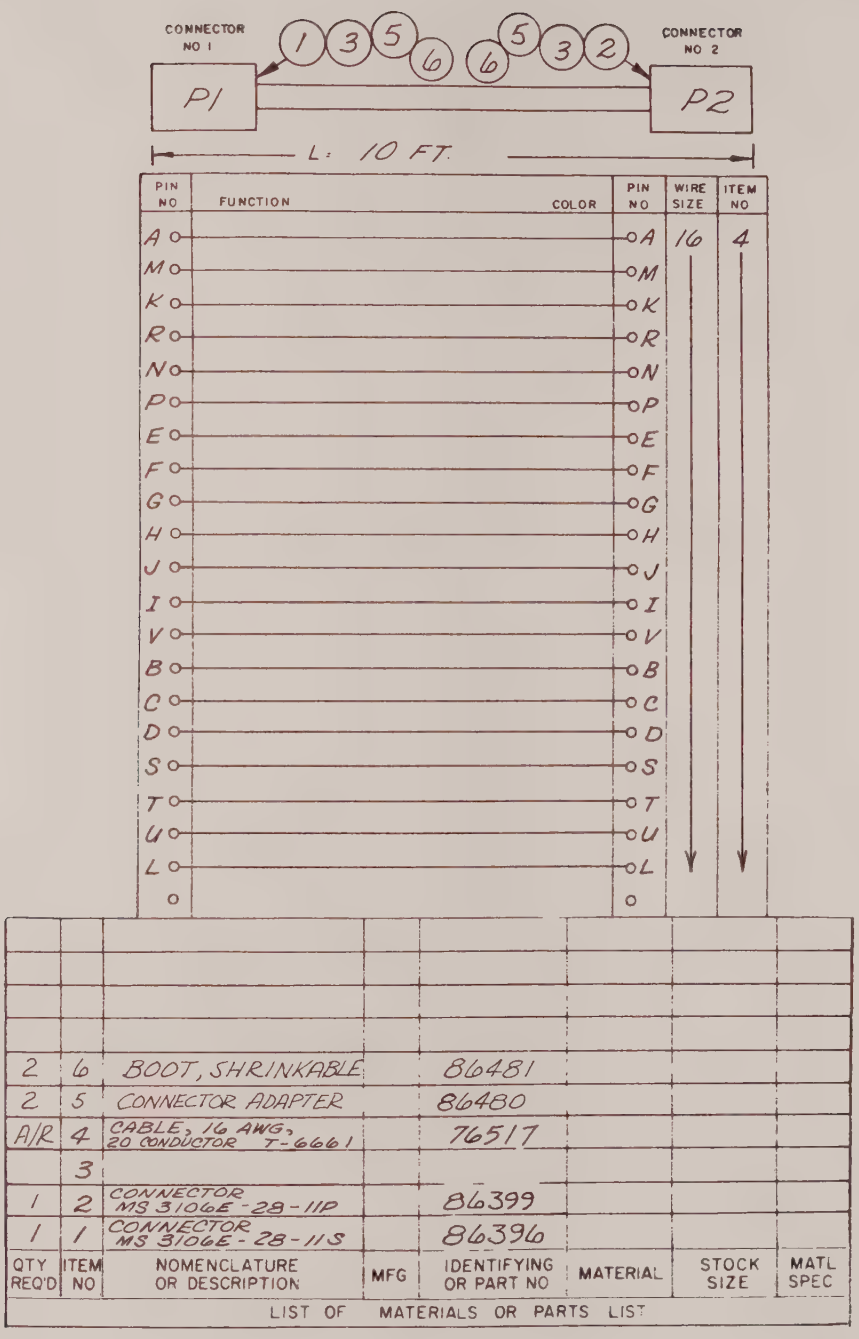
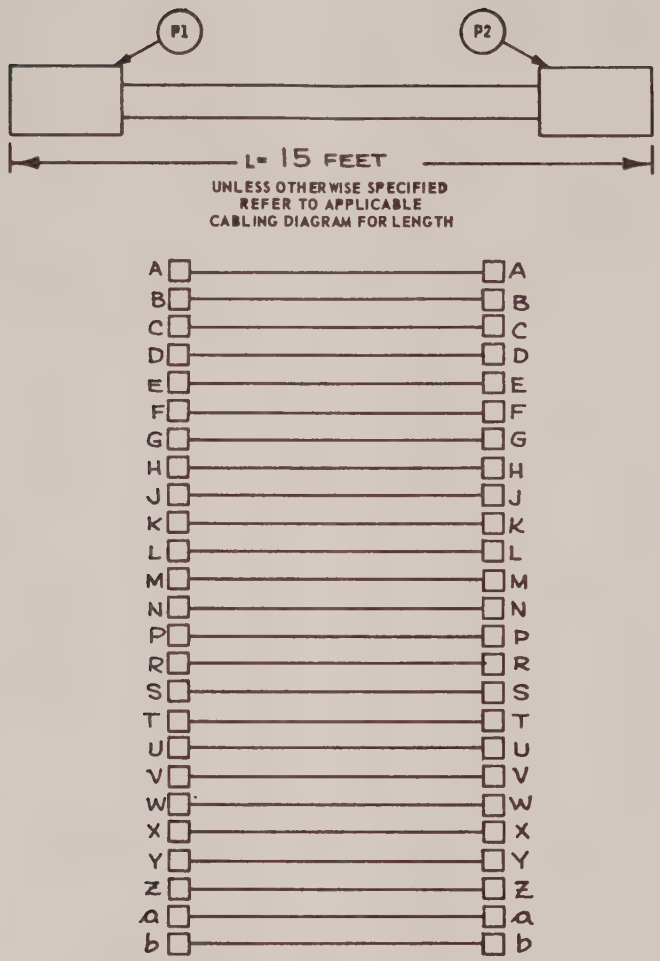


Figure 7-5. Model 4116-20 Local Control Unit Junction Box, Schematic

CONNECTOR NO 1
1 3 5 6
6 5 3 2
CONNECTOR NO 2
P1
P2
L = 10 FT.
PIN NO
FUNCTION
COLOR
PIN NO
WIRE SIZE
ITEM NO
A M K R N P E F G H J I V B C D S T U L
A M K R N P E F G H J I V B C D S T U L
16
4

QTY REQ'D	ITEM NO	NOMENCLATURE OR DESCRIPTION	MFG	IDENTIFYING OR PART NO	MATERIAL	STOCK SIZE	MATL SPEC
2	6	BOOT, SHRINKABLE		86481			
2	5	CONNECTOR ADAPTER		86480			
A/R	4	CABLE, 16 AWG, 20 CONDUCTOR T-6661		76517			
	3						
1	2	CONNECTOR MS 3106E-28-11P		86399			
1	1	CONNECTOR MS 3106E-28-11S		86396			

LIST OF MATERIALS OR PARTS LIST

Figure 7-6. Model 4116A-10 Remote Control Unit, Interconnecting Cable No. 38189 Diagram



ITEM OR FIND NO.	QTY REQD	S-A STOCK NO.	NOMENCLATURE OR DESCRIPTION	MATL SPEC AND SIZE OR COMPONENT VALUE	IDENTIFYING OR PART NO.	CODE IDENT.
5	2	86481	BOOT, SHRINKABLE			
4	2	86480	CONNECTOR ADAPTER			
3						
2	A/R	73233	TUBING, BLACK (OUTSIDE)	PVC105		
1	AR	73374	WIRE STD		#20	
P2	1	78184	CONNECTOR		MS3106E-28-12S	
P1	1	78183	CONNECTOR		MS3106E-28-12P	

PARTS LIST

Figure 7-10. Model 4116A-10 Remote Control Unit, Interconnecting Cable No. 117283 Diagram

CONVERSION OF VOLTAGE AND POWER RATIOS TO DECIBELS

The basic chart below indicates the number of decibels (dB) corresponding to the listed ratios of voltage or power over the range of −20 to +20 dB. For voltage or power ratios greater than those included in the chart, the ratio can be broken down into a product of two numbers, the value in dB for each found separately, and the two results added. Example: To convert a power ratio of 2,000:1 to dB, express 2,000 as 2×10^3; the number of dB corresponding to a power ratio of 2 is very nearly 3, and the number of dB for a power ratio of 10^3 is 30. Therefore, the power ratio of 2,000:1 is approximately 30 dB + 3 dB = 33 dB. In the lower righthand corner of the chart dB values for voltage and power ratios of integral powers of 10 are given.

Voltage Ratio	*Power Ratio*	*−dB +*	*Voltage Ratio*	*Power Ratio*	*Voltage Ratio*	*Power Ratio*	*−dB +*	*Voltage Ratio*	*Power Ratio*	*Voltage Ratio*	*Power Ratio*	*−dB +*	*Voltage Ratio*	*Power Ratio*
1.000	**1.000**	**0**	**1.000**	**1.000**	**.447**	**.200**	**7.0**	**2.239**	**5.012**	**.200**	**.0398**	**14.0**	**5.012**	**25.12**
.989	.977	.1	1.012	1.023	.442	.195	7.1	2.265	5.129	.197	.0389	14.1	5.070	25.70
.977	.955	.2	1.023	1.047	.437	.191	7.2	2.291	5.248	.195	.0380	14.2	5.129	26.30
.966	.933	.3	1.035	1.072	.432	.186	7.3	2.317	5.370	.193	.0372	14.3	5.188	26.92
.955	.912	.4	1.047	1.096	.427	.182	7.4	2.344	5.495	.191	.0363	14.4	5.248	27.54
.944	.891	.5	1.059	1.122	.422	.178	7.5	2.371	5.623	.188	.0355	14.5	5.309	28.18
.933	.871	.6	1.072	1.148	.417	.174	7.6	2.399	5.754	.186	.0347	14.6	5.370	28.84
.923	.851	.7	1.084	1.175	.412	.170	7.7	2.427	5.888	.184	.0339	14.7	5.433	29.51
.912	.832	.8	1.096	1.202	.407	.166	7.8	2.455	6.026	.182	.0331	14.8	5.495	30.20
.902	.813	.9	1.109	1.230	.403	.162	7.9	2.483	6.166	.180	.0324	14.9	5.559	30.90
.891	**.794**	**1.0**	**1.122**	**1.259**	**.398**	**.159**	**8.0**	**2.512**	**6.310**	**.178**	**.0316**	**15.0**	**5.623**	**31.62**
.881	.776	1.1	1.135	1.288	.394	.155	8.1	2.541	6.457	.176	.0309	15.1	5.689	32.36
.871	.759	1.2	1.148	1.318	.389	.151	8.2	2.570	6.607	.174	.0302	15.2	5.754	33.11
.861	.741	1.3	1.161	1.349	.385	.148	8.3	2.600	6.761	.172	.0295	15.3	5.821	33.88
.851	.724	1.4	1.175	1.380	.380	.145	8.4	2.630	6.918	.170	.0288	15.4	5.888	34.67
.841	.708	1.5	1.189	1.413	.376	.141	8.5	2.661	7.079	.168	.0282	15.5	5.957	35.48
.832	.692	1.6	1.202	1.445	.372	.138	8.6	2.692	7.244	.166	.0275	15.6	6.026	36.31
.822	.676	1.7	1.216	1.479	.367	.135	8.7	2.723	7.413	.164	.0269	15.7	6.095	37.15
.813	.661	1.8	1.230	1.514	.363	.132	8.8	2.754	7.586	.162	.0263	15.8	6.166	38.02
.804	.646	1.9	1.245	1.549	.359	.129	8.9	2.786	7.762	.160	.0257	15.9	6.237	38.90
.794	**.631**	**2.0**	**1.259**	**1.585**	**.355**	**.126**	**9.0**	**2.818**	**7.943**	**.159**	**.0251**	**16.0**	**6.310**	**39.81**
.785	.617	2.1	1.274	1.622	.351	.123	9.1	2.851	8.128	.157	.0246	16.1	6.383	40.74
.776	.603	2.2	1.288	1.660	.347	.120	9.2	2.884	8.318	.155	.0240	16.2	6.457	41.69
.767	.589	2.3	1.303	1.698	.343	.118	9.3	2.917	8.511	.153	.0234	16.3	6.531	42.66
.759	.575	2.4	1.318	1.738	.339	.115	9.4	2.951	8.710	.151	.0229	16.4	6.607	43.65
.750	.562	2.5	1.334	1.778	.335	.112	9.5	2.985	8.913	.150	.0224	16.5	6.683	44.67
.741	.550	2.6	1.349	1.820	.331	.110	9.6	3.020	9.120	.148	.0219	16.6	6.761	45.71
.733	.537	2.7	1.365	1.862	.327	.107	9.7	3.055	9.333	.146	.0214	16.7	6.839	46.77
.724	.525	2.8	1.380	1.905	.324	.105	9.8	3.090	9.550	.145	.0209	16.8	6.918	47.86
.716	.513	2.9	1.396	1.950	.320	.102	9.9	3.126	9.772	.143	.0204	16.9	6.998	48.98
.708	**.501**	**3.0**	**1.413**	**1.995**	**.316**	**.100**	**10.0**	**3.162**	**10.000**	**.141**	**.0200**	**17.0**	**7.079**	**50.12**
.700	.490	3.1	1.429	2.042	.313	.0977	10.1	3.199	10.23	.140	.0195	17.1	7.161	51.29
.692	.479	3.2	1.445	2.089	.309	.0955	10.2	3.236	10.47	.138	.0191	17.2	7.244	52.48
.684	.468	3.3	1.462	2.138	.306	.0933	10.3	3.273	10.72	.137	.0186	17.3	7.328	53.70
.676	.457	3.4	1.479	2.188	.302	.0912	10.4	3.311	10.96	.135	.0182	17.4	7.413	54.95
.668	.447	3.5	1.496	2.239	.299	.0891	10.5	3.350	11.22	.133	.0178	17.5	7.499	56.23
.661	.437	3.6	1.514	2.291	.295	.0871	10.6	3.388	11.48	.132	.0174	17.6	7.586	57.54
.653	.427	3.7	1.531	2.344	.292	.0851	10.7	3.428	11.75	.130	.0170	17.7	7.674	58.88
.646	.417	3.8	1.549	2.399	.288	.0832	10.8	3.467	12.02	.129	.0166	17.8	7.762	60.26
.638	.407	3.9	1.567	2.455	.285	.0813	10.9	3.508	12.30	.127	.0162	17.9	7.852	61.66
.631	**.398**	**4.0**	**1.585**	**2.512**	**.282**	**.0794**	**11.0**	**3.548**	**12.59**	**.126**	**.0159**	**18.0**	**7.943**	**63.10**
.624	.389	4.1	1.603	2.570	.279	.0776	11.1	3.589	12.88	.125	.0155	18.1	8.035	64.57
.617	.380	4.2	1.622	2.630	.275	.0759	11.2	3.631	13.18	.123	.0151	18.2	8.128	66.07
.610	.372	4.3	1.641	2.692	.272	.0741	11.3	3.673	13.49	.122	.0148	18.3	8.222	67.61
.603	.363	4.4	1.660	2.754	.269	.0724	11.4	3.715	13.80	.120	.0145	18.4	8.318	69.18
.596	.355	4.5	1.679	2.818	.266	.0708	11.5	3.758	14.13	.119	.0141	18.5	8.414	70.79
.589	.347	4.6	1.698	2.884	.263	.0692	11.6	3.802	14.45	.118	.0138	18.6	8.511	72.44
.582	.339	4.7	1.718	2.951	.260	.0676	11.7	3.846	14.79	.116	.0135	18.7	8.610	74.13
.575	.331	4.8	1.738	3.020	.257	.0661	11.8	3.890	15.14	.115	.0132	18.8	8.710	75.86
.569	.324	4.9	1.758	3.090	.254	.0646	11.9	3.936	15.49	.114	.0129	18.9	8.811	77.62
.562	**.316**	**5.0**	**1.778**	**3.162**	**.251**	**.0631**	**12.0**	**3.981**	**15.85**	**.112**	**.0126**	**19.0**	**8.913**	**79.43**
.556	.309	5.1	1.799	3.236	.248	.0617	12.1	4.027	16.22	.111	.0123	19.1	9.016	81.28
.550	.302	5.2	1.820	3.311	.246	.0603	12.2	4.074	16.60	.110	.0120	19.2	9.120	83.18
.543	.295	5.3	1.841	3.388	.243	.0589	12.3	4.121	16.98	.108	.0118	19.3	9.226	85.11
.537	.288	5.4	1.862	3.467	.240	.0575	12.4	4.169	17.38	.107	.0115	19.4	9.333	87.10
.531	.282	5.5	1.884	3.548	.237	.0562	12.5	4.217	17.78	.106	.0112	19.5	9.441	89.13
.525	.275	5.6	1.905	3.631	.234	.0550	12.6	4.266	18.20	.105	.0110	19.6	9.550	91.20
.519	.269	5.7	1.928	3.715	.232	.0537	12.7	4.315	18.62	.104	.0107	19.7	9.661	93.33
.513	.263	5.8	1.950	3.802	.229	.0525	12.8	4.365	19.05	.102	.0105	19.8	9.772	95.50
.507	.257	5.9	1.972	3.890	.227	.0513	12.9	4.416	19.50	.101	.0102	19.9	9.886	97.72
.501	**.251**	**6.0**	**1.995**	**3.981**	**.224**	**.0501**	**13.0**	**4.467**	**19.95**	**.100**	**.0100**	**20.0**	**10.000**	**100.00**
.496	.246	6.1	2.018	4.074	.221	.0490	13.1	4.519	20.42		10^{-3}	30		10^3
.490	.240	6.2	2.042	4.169	.219	.0479	13.2	4.571	20.89	10^{-2}	10^{-4}	40	10^2	10^4
.484	.234	6.3	2.065	4.266	.216	.0468	13.3	4.624	21.38					
.479	.229	6.4	2.089	4.365	.214	.0457	13.4	4.677	21.88		10^{-5}	50		10^5
										10^{-3}	10^{-6}	60	10^3	10^6
.473	.224	6.5	2.113	4.467	.211	.0447	13.5	4.732	22.39		10^{-7}	70		10^7
.468	.219	6.6	2.138	4.571	.209	.0437	13.6	4.786	22.91	10^{-4}	10^{-8}	80	10^4	10^8
.462	.214	6.7	2.163	4.677	.207	.0427	13.7	4.842	23.44		10^{-9}	90		10^9
.457	.209	6.8	2.188	4.786	.204	.0417	13.8	4.898	23.99					
.452	.204	6.9	2.213	4.898	.202	.0407	13.9	4.955	24.55	10^{-5}	10^{-10}	100	10^5	10^{10}
											10^{-11}	110		10^{11}
										10^{-6}	10^{-12}	120	10^6	10^{12}

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